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LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY. APPENDIX T. PLAN --ETC(U)
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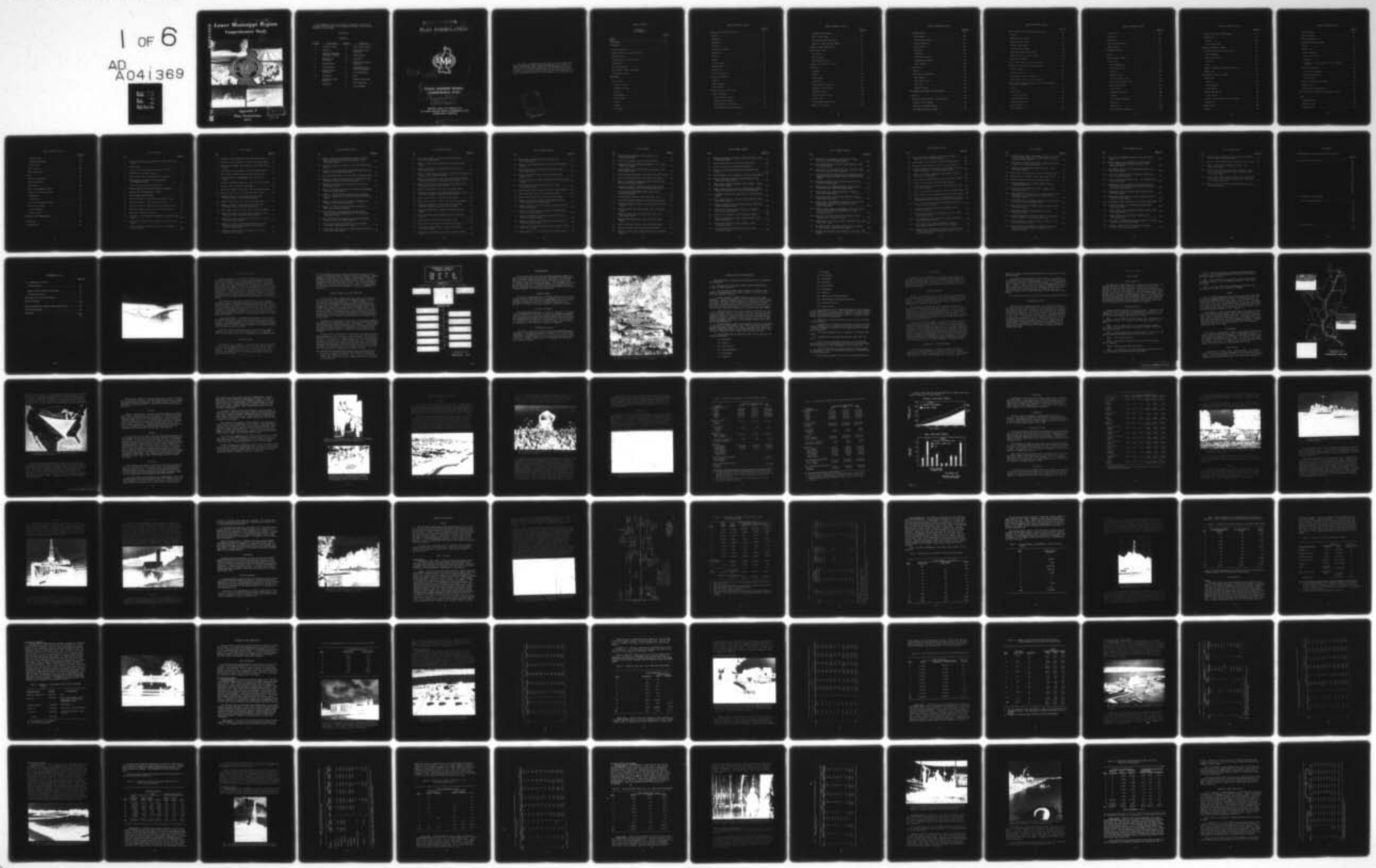

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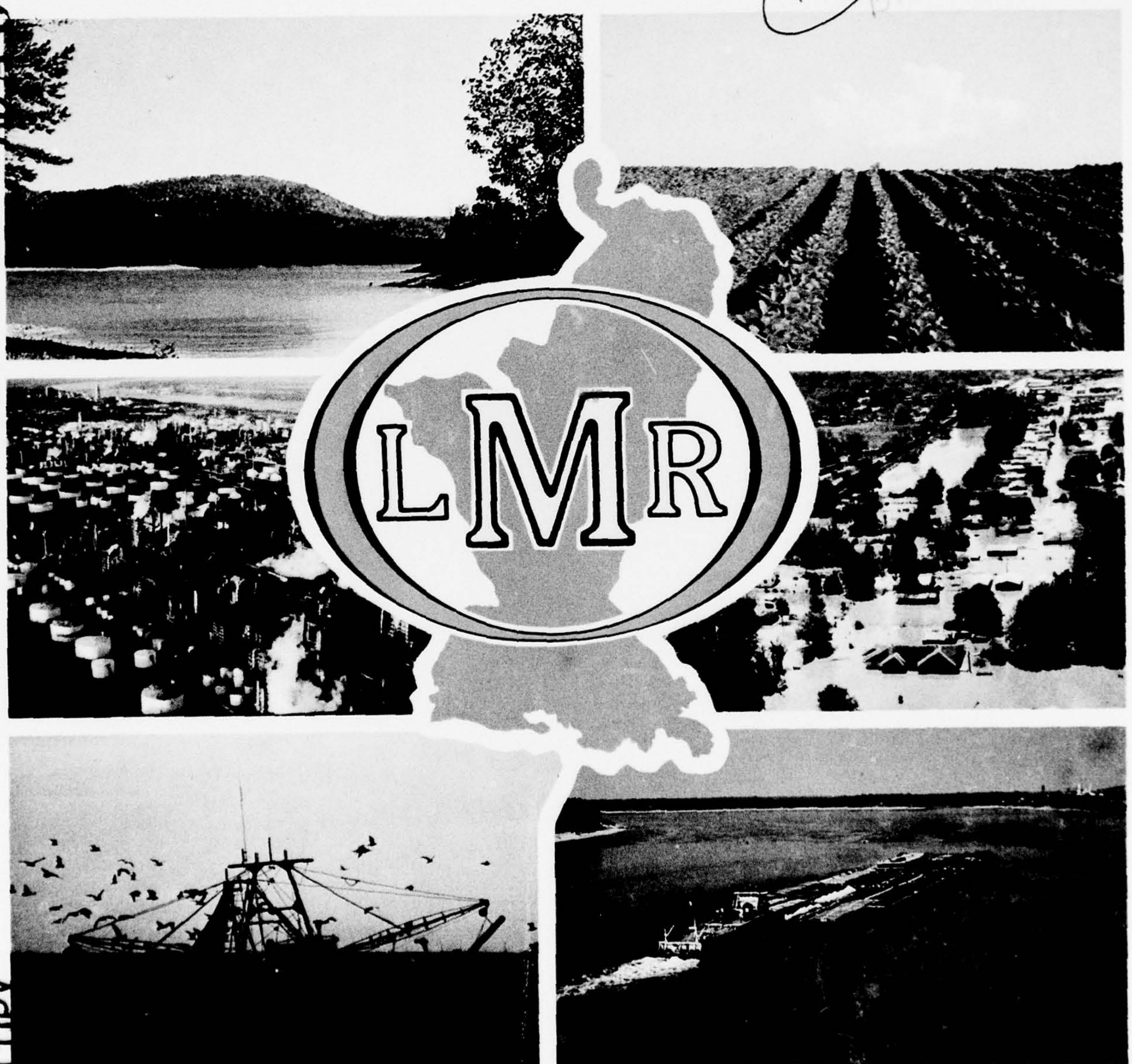
Lower Mississippi Region

Comprehensive Study



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Appendix T

Plan Formulation

1974

This appendix is one of a series of 22 documents comprising the complete Lower Mississippi Region Comprehensive Study. A list of the documents is shown below.

Main Report

Appendixes

Appendix	Description	Appendix	Description
A	History of Study	K	M and I Water Supply
B	Economics	L	Water Quality and Pollution
C	Regional Climatology Hydrology & Geology	M	Health Aspects
D	Inventory of Facilities	N	Recreation
E	Flood Problems	O	Coastal and Estuarine Resources
F	Land Resources	P	Archeological and Historical Resources
G	Related Mineral Resources	Q	Fish and Wildlife
H	Irrigation	R	Power
I	Agricultural Land Drainage	S	Sediment and Erosion
J	Navigation	T	Plan Formulation
		U	The Environment

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PLAN FORMULATION.

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LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY.

Appendix T.

PREPARED UNDER THE SUPERVISION OF
THE LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY
COORDINATING COMMITTEE

410 262

LB

This report was prepared at field level by the Lower Mississippi Region Comprehensive Study Coordinating Committee and is subject to review by interested Federal agencies at the departmental level, by Governors of the affected States, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration.

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PLAN FORMULATION

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PHOTOGRAPHS

The photographs in this appendix were furnished by:

PHOTOGRAPHS (Cont'd)

The Lower Mississippi Region has its beginning at the confluence of two mighty rivers, the Ohio and the Upper Mississippi.

INTRODUCTION

The Mississippi River, fed by the Missouri and Ohio Rivers and other large tributaries, is one of many natural endowments that make the Lower Mississippi Region a leader among the Nation's agricultural areas. With less than 3 percent of the land area of the continental United States, the region accounted for 7 percent of the Nation's total 1968 agricultural earnings. In 1970 crops harvested from 15.6 million acres made the alluvial valley one of the most productive areas in the United States. Further, the region is potentially one of the great industrial areas in the country due to a relative abundance of labor and an almost unlimited supply of good quality water. Thus, the region is expected to grow in population and affluence throughout the next 50-year period.

This growth will come rather slowly at first, with less than a 10 percent increase in population during the next decade. Thereafter, accelerated growth is foreseen and the Water Resources Council has predicted a regional population of 10.2 million by the year 2020. However, if regional growth rates equal the national average, the 2020 population foreseen by the Coordinating Committee will be 11.7 million persons. This greater population is predicted to have nearly eight times the personal income and five times the per capita purchasing power of the population of the 1970's.

Along with increases in population and affluence, needs for water and related land resources will increase substantially over the next 50 years. This appendix addresses the problem of developing a rational program of judicious management of the region's water and related land resources that will satisfy as many as possible of the region's diverse needs between now and the year 2020.

The term "plan" as used herein refers to any of several complete component parts (such as the water quality plan) of the "programs" which are the output of this Type 1, comprehensive, or framework study.

PURPOSE AND SCOPE

The purpose of this appendix is to outline the scope and substance of alternative programs designed to serve as a guide for the conservation, use, and development of the region's water and related land resources. The programs outline the means by which projected local, regional, and national water-related needs and problems can be satisfied, within limitations. → next page

cont

The formulated plans and programs presented herein are based on analyses and broad appraisals of readily available information. Planning judgment was exercised in those elements of the program that had weak statistical qualifications. The probable nature, extent, cost, and scheduling of plans which provide solutions to the various problems are displayed for the years 1980, 2000, and 2020. The views of the public as expressed in public meetings conducted at various locations throughout the study area have been considered in arriving at recommended solutions.

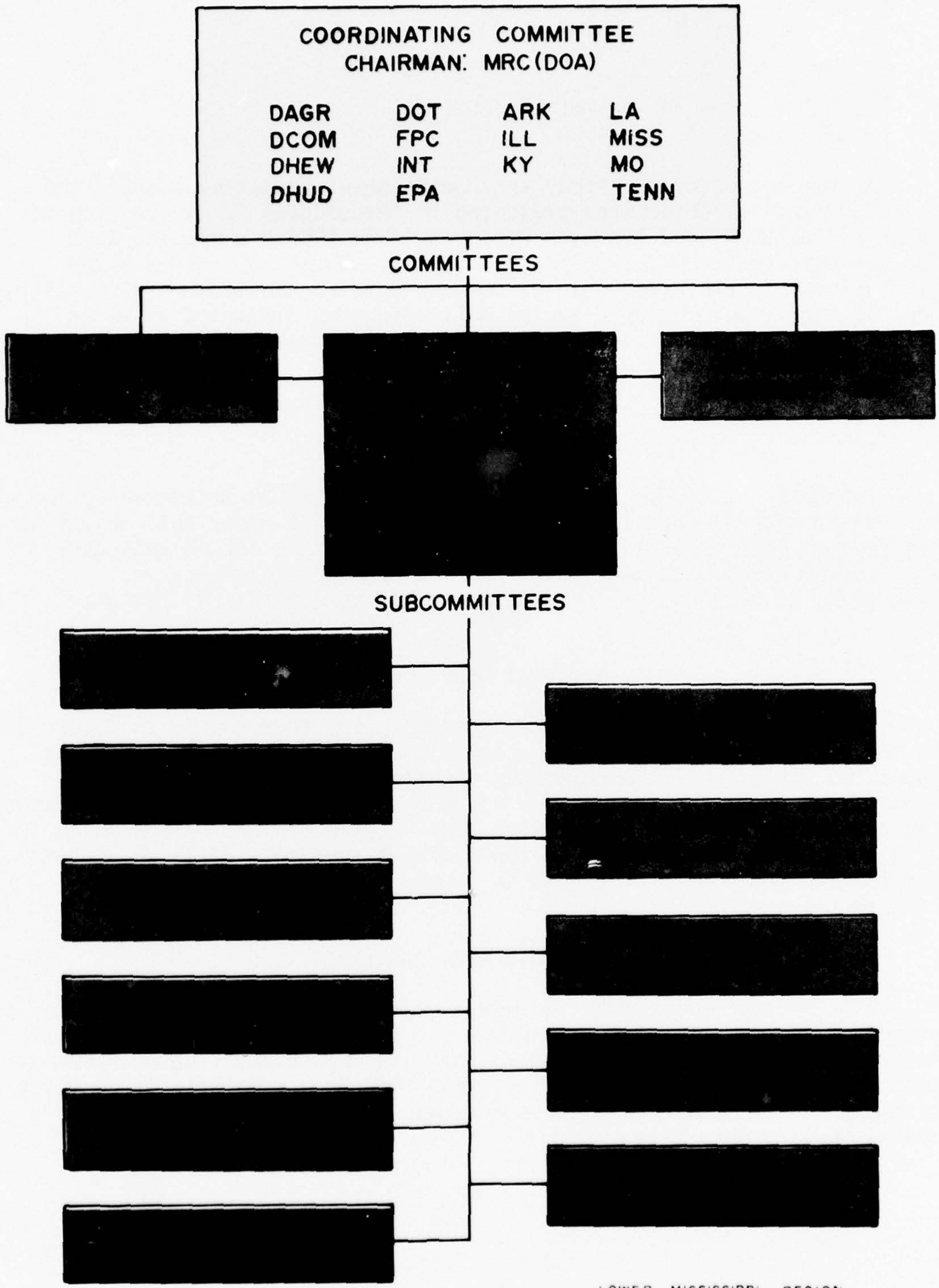
PLANNING CONCEPTS AND STUDY OBJECTIVES

The Lower Mississippi Region Comprehensive Study, the nucleus of which is described in this appendix, was conducted largely in accordance with the concepts postulated in: (1) Senate Document No. 97, (2) Principles and Standards for Planning Water and Related Land Resources, and (3) Guidelines for Framework Studies dated October 1967, as amended by Water Resources Council policy statement dated 22 July 1970.1/ Senate Document 97 provided the basic national policy. These guidelines require that Federal, State, local, and private viewpoints be duly considered in formulating broad programs for meeting the needs and desires of the people, whether such programs involve development or nondevelopment, or are capable of implementation at the Federal, State, or local level.

To guide the overall conduct of the study, a Coordinating Committee was organized with representatives from 10 Federal agencies and 7 States. The Mississippi River Commission chaired that committee. Accomplishment of the work through various subcommittees was a joint responsibility of the States and Federal agencies. Chairmanship of the committees and subcommittees operating under the Coordinating Committee was as shown in figure 1.

Primary activities included (1) establishment of economic and demographic parameters, (2) translation of those parameters into needs for land and water resources, (3) identification of related resource problems and needs, (4) assessment of resource capabilities, (5) investigation of alternative solutions to the region's problems and needs, and (6) formulation of programs to guide future water and land resource conservation management and development toward satisfaction of many of those problems and needs. The output of the study is intended to provide a base from which further detailed problem-oriented planning can begin.

1/ The Principles and Standards for Planning Water and Related Land Resources, as adopted in September 1973, postdate the formative stages of the Comprehensive Study. Hence, there are some elements of the study that do not follow the adopted Principles and Standards in their entirety.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

ORGANIZATION CHART

FIGURE 1

MULTIOBJECTIVES

At the outset of the study the Coordinating Committee adopted the specific national objectives presented in "Procedures for Evaluation of Water and Related Land Resource Projects, June 1969," a special task force report to the Water Resources Council. These objectives were: (1) National Income, (2) Regional Development, (3) Environmental Quality, and (4) Social Well-being. Social Well-being was dismissed as an explicit study objective in the fall of 1971, but was adopted as the overriding determinant in the other three objectives.

National Income

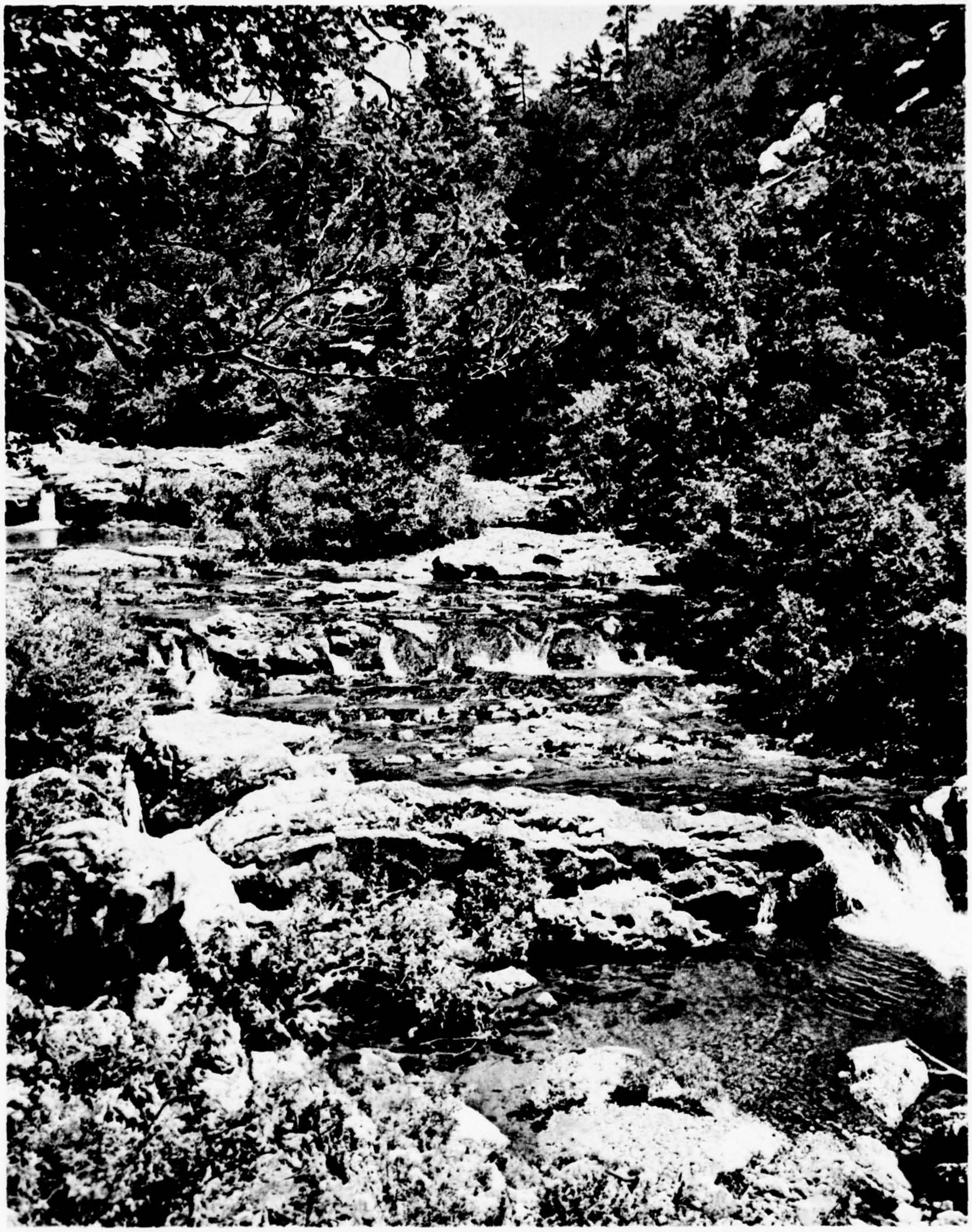
The National Income Objective is achieved through increases in the Nation's output of goods and services. Investments under this objective continue so long as unit social and economic returns exceed unit costs. The program formulated herein for the National Income objective, Program A, is based on projections contained in Appendix B, Economics.

Regional Development

The program formulated under this objective (Program B) is directed to the satisfaction of needs and the solution of problems accompanying specified conditions of accelerated economic growth within the region. Projections under the Regional Development objective are consistent with the assumption that the Lower Mississippi Region has sufficient potential to grow at a rate equal to the national average. Basic parameters for Program B are also contained in Appendix B, Economics.

Environmental Quality

This objective reflects the human concern for preservation and improvement of our natural surroundings in harmony with the socioeconomic environment. In formulating a plan for this objective, Program A components were included to the extent that they do not materially conflict with nature. Economic parameters were not developed for the Environmental Quality Objective.



Environmentally significant features such as this scenic stream received maximum consideration in the formulation.

PLANNING POLICIES AND CONSTRAINTS

Plan formulation was guided by the following policies, assumptions, and constraints:

a. The region will experience economic growth compatible with national economic objectives.

b. All formulated programs must be complete in themselves and capable of implementation. This means they must be socially, politically, and financially feasible.

c. Studies leading to programs should not involve basic data generation. Program alternatives will not be analyzed for economic justification. However, recommended measures are required to have a reasonable chance for economic justification should such analysis be made. Selection of alternatives will be made on the basis of practicality with least-cost a primary consideration. Estimates will be derived by general relations, calculated approximations, available data, and judgment.

d. Framework program costs will be limited to those most apt to be borne by the public sector. Accordingly, costs for acquisition of land will be displayed for recreation, fish and wildlife, and environmental components, whereas no land acquisition costs will be included for agriculture and forestry production. However, public sector costs for more intensive management if utilized as an alternative measure will be displayed where appropriate.

e. The Environmental Quality Program shall include basic components for satisfaction of environmental needs. Both the National Income and Regional Development Programs will contain components which enhance the region's natural environment to the extent that this can be done without materially detracting from the single objective being stressed.

f. Quantification and satisfaction of needs will be limited to the following categories:

(1) Agriculture

(2) Forestry

(3) Electric Power

(4) Fish and Wildlife

(5) Flood Damage

(6) Irrigation

(7) Drainage

(8) Water Supply

(9) Navigation

(10) Recreation

(11) Water Quality

(12) Environment

(13) Minerals

(14) Coastal and Estuarine Resources

(15) Archeological and Historical Resources

(16) Sediment and Erosion

(17) Health Aspects

g. Plan formulation will be supported primarily by data contained in other appendixes. In certain cases, additional or updated information may be used, and other data may be revised or re-scaled as appropriate. Such additions and/or revisions, when of significant import, will be clearly noted and explained.

h. Multiple-use, multiple-objective concepts will be considered in the formulation.

i. Programs will be formulated individually for each of 10 water resource planning areas (see page 11) except where optimum solutions transgress boundaries, in which case two or more areas will be formulated concurrently.

j. The regional program will be a composite of individual WRPA plans.

k. Programs will be presented for the years 1980, 2000, and 2020.

l. Only existing interregional transfers will be considered. Future depletions in areas draining into the Lower Mississippi Region will be accounted for in the assessment of water availability.

m. Current Federal policy and Public Law 92-500 (Water Quality Act Amendments of 1972) will be primary constraints in formulation of the water-quality plan.

n. Well-being of people will be the over-riding consideration.

COORDINATION

Preparation of this appendix was the responsibility of the Plan Formulation Committee, with the work delegated to a Plan Formulation Task Force with membership open to the 10 Federal agencies and 7 States participating in the study. State inputs were directed primarily at developing environmental program components and the public involvement aspects of the study.

PUBLIC INVOLVEMENT

The public's needs and desires as perceived by the plan formulators were duly considered in formulating the plans and programs described herein. This input was obtained by way of a public involvement program composed of public meetings and attitudinal surveys, supplemented by informational brochures and news releases.

The first phase of the program involved public orientation. A movie depicting planning objectives and categories of need was shown. Information was collected on which study objectives the public considered appropriate and the first informational brochure was distributed. Public response varied depending upon the political atmosphere and institutional arrangements within each State. A computer analysis of the results obtained indicated a consensus in favor of continued economic growth and increased tourism.

The second phase of the program provided for further exchange between the public and study managers. Information on natural resource related needs was displayed by way of 35 mm. slides with accompanying narrative. Additional data were gathered from a comprehensive questionnaire structured to obtain an indication of needs the public considered important. A second informational brochure was circulated. The result of this portion of the program substantiated the earlier consensus for resource and industrial development, but with the proviso that a quality natural environment be maintained for future generations. A detailed discussion of the public involvement program, including participation by the various States, can be found in Appendix A, History of Study.

RELATIONSHIP TO OTHER APPENDIXES

The basic data appendixes - Economics; Regional Climatology, Hydrology and Geology; Inventory of Facilities; and Land Resources - provided the base from which plan formulation was begun. Land Resources, while serving as a basic data document, also served as a functional

appendix by showing land acreage requirements for satisfaction of food and fiber needs.

Functional or needs appendixes, such as Municipal and Industrial Water Supply, Water Quality and Pollution, et al, were limited in scope to quantifying resource related problems and needs. This appendix presents a summary of needs in terms of relative management efficiencies implicit in their quantification, and categorical adjustments resulting from a common base. It also presents alternative measures and costs, and describes the integration of pertinent elements into single-objective programs and a recommended program for the Lower Mississippi Region.

The Summary Report presents an abstract of the recommended program.

PRESENTATION OF DATA

Following this introductory section is a detailed description of the study area which contains data on resource availability, status of development, future needs and problems, and alternatives for satisfying those problems and needs. The third section presents plan formulation rationale and methodology specifically oriented to the unique features of each of the single-objective programs and the recommended program for the region. A discussion of the framework program, its cost, and scheduling and implementation follows. Needs for additional studies are presented in the next-to-last section, and the conclusions and recommendations of the Coordinating Committee are summarized in the final section. Throughout the appendix, the discussion highlights significant features of each of the 10 WRPA's, pointing out special problems and needs.

THE REGION

AREA OF STUDY

Location and Size

The Lower Mississippi Region lies in portions of seven States. Its northern extremity at Cairo, Illinois, is about 600 miles (954 miles traveling the Mississippi River) inland from the Gulf of Mexico. It averages 170 miles in width (figure 2). Included in this 102,400 square mile area is the entire drainage basin of the Mississippi below its confluence with the Ohio River, except for portions of the Arkansas, Red, and White River subbasins above the backwater limits of the design flood for the "Mississippi River and Tributaries Project." Also included are the flood-protected area at Cairo, Illinois, the Ouachita, Boeuf, and Tensas Basins in Arkansas, and the Louisiana coastal area which drains into the Gulf between the Pearl and Sabine River divides.

Planning Divisions

Resource problems and needs are many and varied. Some apply to the region as a whole, but most do not lend themselves to solution on a regional basis. Study of the area was simplified by subdividing it into 10 Water Resource Planning Areas (WRPA's) as follows:

WRPA 1 - The main stem of the Mississippi River, extending to and including the levees or to the river's top bank where levees do not exist.

WRPA 2 - The St. Francis Basin, St. Johns-New Madrid Floodway, Lower White and Bayou Meto Basins, including the Arkansas River below Pine Bluff, Arkansas.

WRPA 3 - The drainage basins in west Kentucky, west Tennessee, and extreme northern Mississippi, and the Cairo, Illinois, area.

WRPA 4 - The Yazoo River Basin.

WRPA 5 - The Ouachita River Basin, and the Red River below Hot Wells, Louisiana.

WRPA 6 - The Boeuf and Tensas River Basins.

WRPA 7 - The Big Black River Basin and basins of southwest Mississippi streams that drain into the Mississippi River.

WRPA 8 - The Baton Rouge area, including the drainage area of streams that flow into Lake Pontchartrain except for the Tchefuncta River and streams to the east.

WRPA 9 - The Louisiana coastal area from the east limits of the Atchafalaya Floodway to the east hydrologic boundary of the Sabine River Basin.

WRPA 10 - The New Orleans area, including the Tchefuncta River area, and the area east of the Atchafalaya Floodway.

Climate

This is a humid subtropical region with occasional dry spells that have been of damaging duration less than a half-dozen times since 1935. Precipitation averages from 50 to 60 inches a year, temperatures vary from a low of 48° F. for the average January to 80° F. for the average July, and the frost-free growing season lasts from 182 days in the north to 353 days in the south. The lesser rainfall amounts and shorter growing season are both typical of the northern part of the region, as are recorded temperature extremes of -26° F. and 112° F.

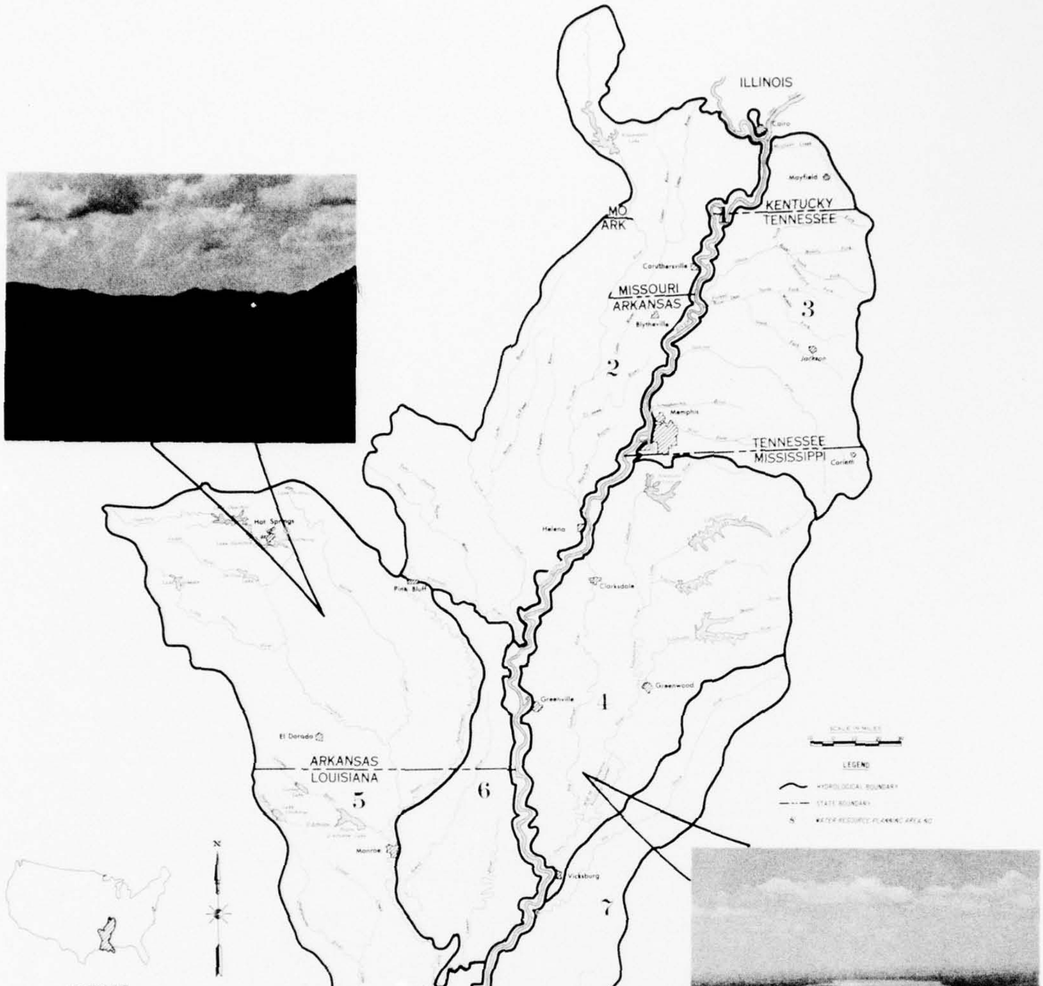
Minor amounts of snow and sleet contribute to the yearly precipitation, with average snowfall ranging from 12 inches in Missouri to less than 1 inch in central and southern Louisiana. Freezing rain and glaze occur rarely but can have severe impacts, as in the winter of 1972-1973 when power and communication lines were damaged in northern Mississippi. Hail occurs periodically but seldom causes measurable damage. Tornados, hurricanes, and tropical storms occasionally cause severe damage in various sections of the region.

Physiography

Land forms, as illustrated in figure 2, range from the nearly flat alluvial valley of the Mississippi River, to the rugged relief of the Ouachita and Ozark Mountains in Arkansas and Missouri, respectively, to the saltwater marshlands of the Gulf Coast. The alluvial valley, covering roughly one-third of the region's area, is by far the most significant of these land forms. It separates the remaining two-thirds of the region, 60 percent to the west and 40 percent to the east.

Major Streams

North America's greatest river - the Mississippi - has long been a major factor in the economic development of the Lower Mississippi Region. The total area drained by the river covers more than 1,245,000 square miles and includes all or parts of 31 States and two Canadian

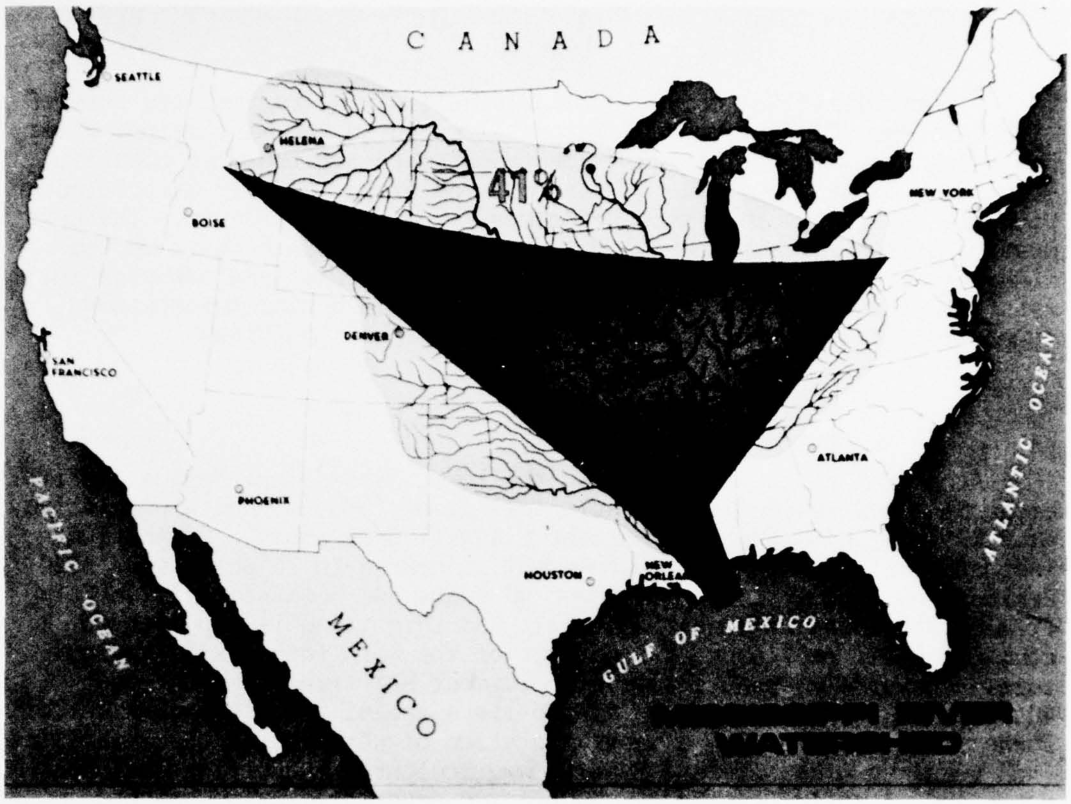


LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

PHYSIOGRAPHIC LAND FORMS

FIGURE 2

provinces. Water from as far east as New York and as far west as Montana flows in the lower river. As the main stem of a major network of over 12,000 miles of navigable inland waterways, it is of great importance to the expanding commerce of mid-America. Its abundant reservoir of water and its strategic economic location have attracted many vital industries and enhance the region's potential for agricultural and industrial growth.



The Lower Mississippi River drains 41 percent of the conterminous United States.

Interior drainage from about 49,700 square miles flows into the Mississippi River through major tributary streams. Most of the region's remaining area drains through the Ouachita, Boeuf, and Tensas Basins to the Red River, thence into the Atchafalaya River which empties into the Gulf. The Calcasieu, Mermentau, and Vermilion Rivers west of the Atchafalaya River in WRPA 9 and minor drainage basins in WRPA 10 also empty directly into the Gulf. The Amite, Tickfaw, Natalbany, Tangipahoa, and Tchefuncta Rivers in WRPA 8 contribute water to the Gulf by way of Lake Pontchartrain.

Major streams tributary to the Mississippi River are the St. Francis River in Arkansas and Missouri, the White and Arkansas Rivers in Arkansas, and the Yazoo River in Mississippi. The Arkansas, White, and Red Rivers contribute a considerable amount of flow into the Lower Mississippi Region itself.

Forests

Almost 30 million acres, or nearly half of the region, are covered with forests. Oak-gum-cypress forests located in the Mississippi River Delta and along the major and minor tributaries are the most plentiful, comprising about 30 percent of the forested area. Closely associated with the oak-gum-cypress type are elm-ash-cottonwood forests. The next most plentiful forests are comprised of stands of oak-hickory on the higher ridges and mountains. Loblolly-shortleaf pine and oak-pine forests grow throughout the region and longleaf-slash pine forests are found along the coastal plains of Mississippi and Louisiana.

Economy

According to the 1970 census, the Lower Mississippi Region and its eight Standard Metropolitan Statistical Areas (SMSA's) had a population of 6,293,000, with about 60 percent classified as urban. Projections indicate that the urban percentage will increase to 76 percent by 2020. Regional employment during the past 40 years has been steadily shifting from agricultural to nonagricultural, and this trend is expected to continue until only about 2.5 percent of the work force is in agriculture. Conversely, manufacturing employment has tripled in the past 40 years and will continue to expand its share of the total work force. These trends are causing a heavy migration of workers and their families from rural to urban areas. Major nonagricultural industries include petroleum, textile, chemical, and a large group of service-oriented activities.

The People

Early explorers and settlers found in this region an exciting new frontier. The fertile alluvial valley invited crop experimentation and resource exploitation. A substantial fish and game population attracted numerous trappers, hunters, and fishermen, while the river itself provided a major transportation link between settlements along the river and between these settlements and European markets.

Two major factors set the early course of development. First, the European settlers were mainly dependent upon water transportation, and were influenced by the river to the extent that the site for the city of New Orleans was selected solely for the purpose of gaining (and

later controlling) access to the river for transportation. Second, the settlers relied primarily on agriculture for their livelihood. Cultivation of the soil began with settlement, spreading from its embryonic stages in the lower reaches of the alluvial valley to occupy most of the region. Today agriculture is joined by industry in sustaining the region's economy. Both influence the culture and life-style of its inhabitants.

The present culture reflects the influence of several groups, including native Indian tribes and French, Spanish, and German settlers. Most notable among the European influences are those originating from early French-speaking settlers, best illustrated in the contemporary land divisions, life-styles, names, speech, and cuisine that are characteristic of Louisiana.

The influence of the Negro is equally evident. The exploitation of this human resource helped sustain the region's lavish plantation economy of the early 1800's, and it was this ethnic group that contributed many unique styles of music and dance which prevail today. The sound of a trumpet wailing the blues - first heard on Beale Street in Memphis where the blues were born and reaching its culmination on Basin Street in New Orleans - is now heard round the world.

In the sparsely populated areas of the Ouachita Mountains in Arkansas, there is a deep-rooted "mountain" culture having its distinctive background and customs. The proud people of the Ouachitas carry on a culture and speak a language reminiscent of 18th Century England.

Various religions are established in the region. Protestant faiths, the result of resettlement by immigrants from the eastern seaboard, generally dominate except in southern Louisiana and certain areas along the Mississippi River where the Roman Catholic faith, a manifestation of French and Spanish influences, is the most widespread.

Onetime jazz and gambling mecca, Beale Street in Memphis, Tennessee, shows no trace of its colorful past.

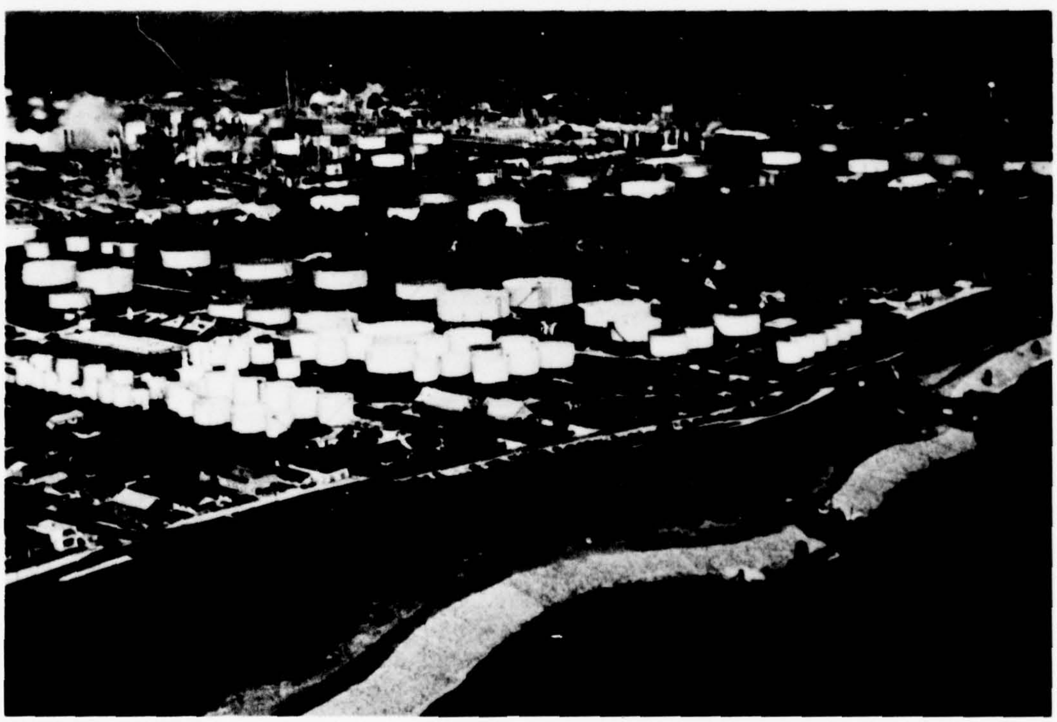
Local chefs stir a steaming pot of jambalaya - chicken, rice, onions, and seasonings - at the 1970 Jambalaya Festival in Gonzales, Louisiana.

ECONOMY AND ECONOMIC PROJECTIONS

General

The regional economy founded upon the agricultural productivity of the alluvial valley is being balanced by expansion in various industrial sectors, especially manufacturing and minerals. Such expansion and diversification have not detracted from the importance of the highly productive agricultural industry, but have altered the economic base, with manufacturing and minerals now leading agriculture in terms of output.

Along the banks of the Mississippi River between Baton Rouge and New Orleans are over 100 industrial plants having a total value of $8 billion. The largest oil refinery in the United States is located at Baton Rouge, as are several chemical plants producing a variety of related commodities. Southern areas of the region are underlain by extensive oil and gas fields as well as vast deposits of salt and sulfur. Metallic minerals are produced in northwest areas and nonmetallic minerals other than salt and sulfur are extracted from all areas of the region.



Many industrial plants locate on the Mississippi River to take advantage of river transportation and an abundant water supply.

This is one of the major food and fiber producing areas in the Nation. Its output includes a variety of high yielding crops and forest species, livestock, and livestock products. The thriving economy is largely due to a bountiful water supply, abundant labor pool, and water transport system provided by the Mississippi River.

Cotton, once king of the region's crops, is still important to the agricultural economy.

Forecasts of an expanding nonagricultural employment base vis-a-vis a shrinking agricultural employment base are largely the outgrowth of huge gains in agricultural technology and inflationary pressures for higher income-producing industries. By the year 2020 agricultural employment is expected to fall to half the 1970 level, yet agricultural output is expected to at least double. During the same period, manufacturing employment is projected to double, and the production of manufactured goods is predicted to increase by a factor of 10. Accompanying demographic changes are expected to follow past trends, which show that the urban-rural population balance has shifted from the 57-43 percent split of 20 years ago to the current split of 60-40 percent. A large portion of the current rural population commutes to work in urban manufacturing centers, and this trend is expected to continue.

Significant aspects of the historical and projected trends and changes in the economic base are discussed in the following paragraphs. Economic parameters like population, employment, and earnings are discussed individually and in terms of their potential impact on the regional economy. Table 1 presents regional economic parameters, both historical and projected, for Programs A (National Income) and B (Regional Development).

Population

Between 1970 and 2020 the regional population will grow 62 percent under Program A projections or 85 percent under Program B projections. This compares to a projected 96 percent increase in the national population. The area's recorded 1970 population was 6.3 million. Projected populations are 10.2 and 11.7 million by 2020 under Programs A and B, respectively. Urban centers such as Memphis (WRPA 3), Baton Rouge (WRPA 8), and New Orleans (WRPA 10) are expected to sustain the highest population growth rates.

Presently, 6 out of every 10 people in the region live in urban areas such as New Orleans, Louisiana.

Table 1 - Economic Profile Summary for Lower Mississippi Region[1/]

Parameter	Data for Indicated Years 1950	1960	1968
Population (1 July)[2/]			
Program A	5,545,348	5,826,287	6,293,977
Urban	2,384,500	3,087,932	3,588,343[3/]
Rural	3,160,848	2,738,355	2,612,096[3/]
Program B	5,545,348	5,826,287	6,293,977
Urban	2,384,500	3,087,932	3,588,343[3/]
Rural	3,160,848	2,738,355	2,612,096[3/]
Personal Income[4/]			
Program A	7,267,311	9,701,464	15,402,808
Program B	-	-	-
Per Capita[4/]			
Program A	1,311	1,655	2,447
Program B	-	-	-
Earnings[4/]			
Total, Program A	5,908,523	7,919,503	12,280,220
Total, Program B	-	-	-
Per Worker, Program A[4/]	3,224	4,226	5,550
Per Worker, Program B	-	-	-
Employment			
Total Program A	1,832,672	1,873,933	2,212,522
Agricultural	569,900	296,079	231,648
Manufacturing	255,527	322,926	387,356
Total Program B	-	-	-
Agricultural	-	-	-
Manufacturing	-	-	-
Gross Manufacturing Product[4/]			
Total Program A	-	-	4,186,000
Total Program B	-	-	-
Gross Farm Marketing Receipts[4/]			
Program A	-	-	2,145,000[5/]
Program B	-	-	-

1/ Program A forecasts are based on OBERS projections as approved by the U.S. Water Resources Council; Program B forecasts reflect a regional employment growth rate equal to the national rate. Methodology for both programs is explained in the section on methodology at the end of Appendix B, Economics.

2/ U.S. Bureau of Census figures show the 1970 population of the Lower Mississippi Region as 6,293,233.

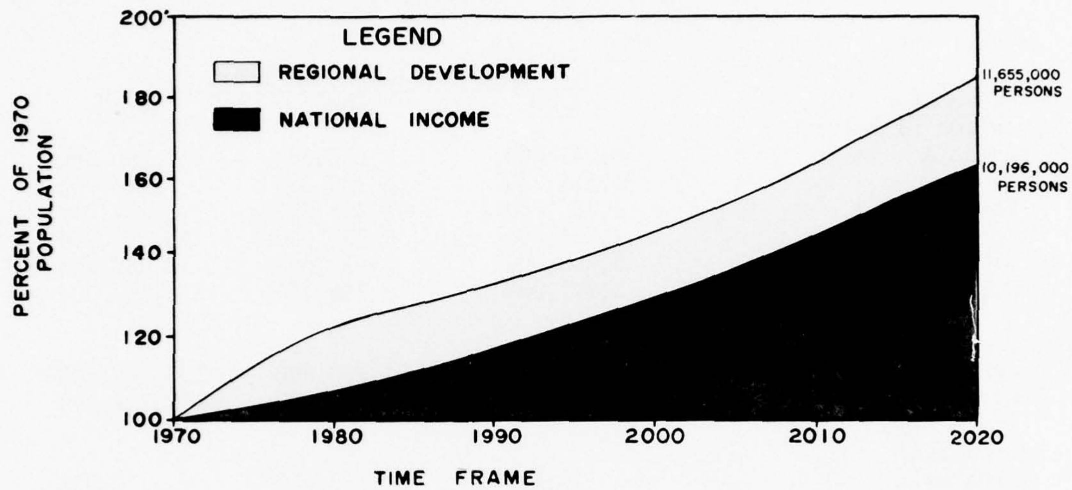
Table 1 - Economic Profile Summary for Lower Mississippi Region[1/] (Cont'd)

Parameter	1980	2000	2020
	Data for Indicated Years		
Population (1 July)[2/]			
Program A	6,741,000	8,156,000	10.196,000
Urban	4,314,240	5,709,200	7,748,960
Rural	2,426,760	2,446,800	2,447,040
Program B	7,825,000	9,188,000	11,655,000
Urban	5,008,000	6,431,600	8,857,800
Rural	2,817,000	2,756,400	2,797,200
Personal Income[4/]			
Program A	24,201,000	54,500,000	123,128,000
Program B	26,533,000	63,032,000	145,221,000
Per Capita[4/]			
Program A	3,590	6,682	12,076
Program B	3,700	6,980	12,570
Earnings[4/]			
Total, Program A	19,003,000	42,028,000	93,758,000
Total, Program B	20,834,000	48,607,000	110,580,000
Per Worker, Program A[4/]	7,865	13,813	23,937
Per Worker, Program B	7,865	13,813	23,937
Employment			
Total Program A	2,416,000	3,043,000	3,917,000
Agricultural	135,000	103,000	101,000
Manufacturing	484,000	629,000	803,000
Total Program B	2,649,000	3,519,000	4,620,000
Agricultural	137,000	112,000	110,000
Manufacturing	531,000	728,000	948,000
Gross Manufacturing Product[4/]			
Total Program A	7,027,000	16,666,000	37,979,000
Total Program B	7,704,000	19,275,000	44,793,000
Gross Farm Marketing Receipts[4/]			
Program A	2,770,000	3,284,000	3,841,000
Program B	2,770,000	3,540,000	4,150,000

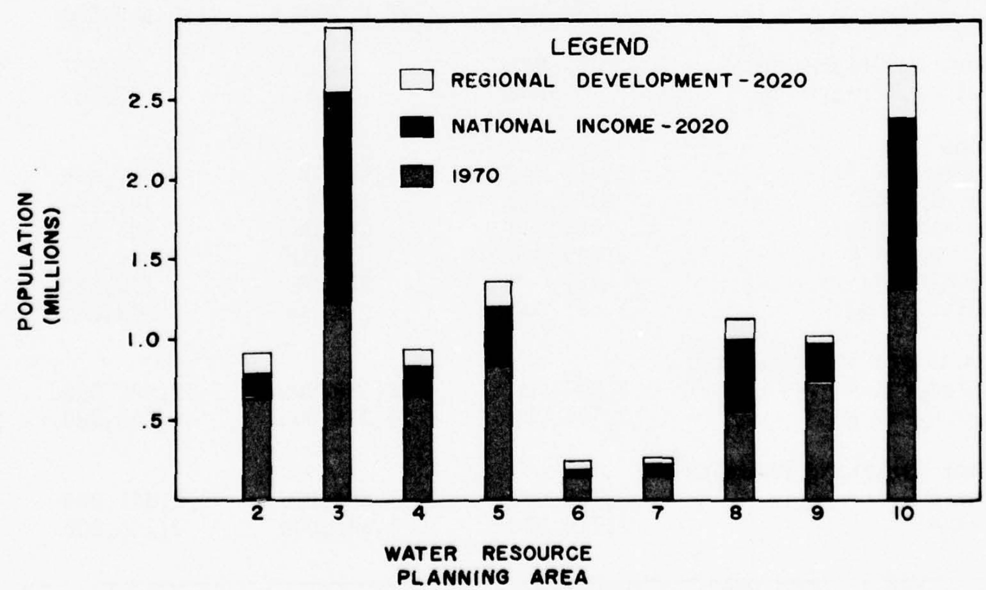
3/ Extrapolated using 1960 and 1980 figures.
4/ Personal income, earnings, gross manufacturing product, and gross farm marketing receipt values are given in thousands of 1967 dollars; per capita income and per worker earnings values are given in 1967 dollars.
5/ 1970 data.

Figure 3 shows both 1970 and 2020 population by WRPA's and allows a quick comparison of relative growth.

REGIONAL POPULATION GROWTH



WRPA POPULATION GROWTH



LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY

REGIONAL AND WRPA POPULATION GROWTH

FIGURE 3

Employment

Approximately 35 percent of the region's population was employed during the 1960's. This proportion is projected to gradually increase, with the year 2020 percentages placed at 38 and 40 percent under Programs A and B, respectively (compared to 41 percent for the Nation). Thus, by 2020 the 1968 employment of 2.2 million will reach 3.9 million under Program A, or 4.6 million under Program B.

Production

Economic output is expected to expand steadily during the next 50 years. Agricultural production will double, petroleum output will quadruple, and manufacturing will expand tenfold. Especially important is the projection that chemical industry output in the year 2020 will be 15 to 18 times greater than it was in 1968.

Earnings and Income

Historic productivity per worker has increased at an average annual rate of 3 percent. Study forecasts of anticipated technological advancement indicate that the future rate will be the same. A phenomenal increase in average earnings per worker can be expected - from $5,550 in 1968 to $23,937 by 2020, based on the equivalent dollar purchasing power existing in 1967.

Total earnings of workers in the region, when the increased productivity per worker and higher employment ratio are evaluated, will expand in terms of 1967 dollars from $12 billion in 1968 to about $100 billion by 2020. The significance of such increase on earnings by the major industries is summarized in table 2.

When translated to a per capita basis, this means that the average per capita income (in 1967 dollars) will rise from $2,447 in 1968 to more than $12,000 in 2020 under either Program A or B. (If measured in 1973 dollars, this means that the average income of a family of four in the region will approach $65,000 by 2020.)

Agriculture

In 1949 there were over 430,000 farms in the region, averaging only 80 acres in size; by 1970 the number had declined to 140,000, with the average size increasing to over 200 acres. Expectations are that the number will continue to decline with a corresponding increase in size.

Table 2 - Earnings by Major Industries in Lower Mississippi Region 1/

Industry	Earnings for Indicated Years 2/					
	1950	1959	1968	1980	2000	2020
Total, Program A	5,908,523	7,919,503	12,280,220	19,003,000	42,028,000	93,758,000
Total, Program B	--	--	--	20,834,000	48,607,000	110,580,000
Per Worker						
Program A	3,224	4,226	5,550	7,865	13,813	23,937
Program B	--	--	--	7,865	13,813	23,937
Agriculture						
Program A	1,272,921	1,115,692	1,232,087	1,011,000	1,281,000	2,236,000
Program B	--	--	--	1,109,000	1,481,000	2,638,000
Forestry & Fisheries						
Program A	25,986	18,886	19,012	27,000	52,000	93,000
Program B	--	--	--	30,000	60,000	110,000
Mining						
Program A	137,298	344,697	450,991	636,000	955,000	1,348,000
Program B	--	--	--	697,000	1,104,000	1,590,000
Manufacturing						
Program A	977,238	1,431,140	2,550,755	4,104,000	9,159,000	20,105,000
Program B	--	--	--	4,499,000	10,593,000	23,712,000
Food & Kindred Products						
Program A	181,017	236,574	317,722	369,000	558,000	898,000
Program B	--	--	--	405,000	645,000	1,059,000
Textile Mill Products						
Program A	29,202	31,659	49,121	86,000	175,000	347,000
Program B	--	--	--	94,000	203,000	409,000
Chemical & Allied Products						
Program A	87,638	165,523	296,534	528,000	1,304,000	3,015,000
Program B	--	--	--	579,000	1,508,000	3,556,000
Paper & Allied Products						
Program A	76,694	129,903	193,640	311,000	667,000	1,434,000
Program B	--	--	--	341,000	772,000	1,691,000
Petroleum Refining						
Program A	93,798	123,659	151,855	206,000	356,000	618,000
Program B	--	--	--	226,000	412,000	729,000
Primary Metals						
Program A	8,685	44,828	74,192	100,000	173,000	294,000
Program B	--	--	--	110,000	200,000	347,000
Other Manufacturing						
Program A	500,204	698,994	1,467,691	2,504,000	5,926,000	13,499,000
Program B	--	--	--	2,744,000	6,853,000	15,921,000
All Other						
Program A	3,495,080	5,009,088	8,027,375	13,225,000	30,581,000	69,976,000
Program B	--	--	--	14,499,000	35,369,000	82,531,000

1/ Program A from OBERS data.
2/ All earnings except per worker earnings are given in thousands of 1967 dollars; per worker earnings are given in 1967 dollars.

Crops now account for 83 percent of marketing receipts, and livestock and livestock products comprise the remainder. Soybeans, cotton, rice, hay, and corn collectively used 93 percent of the harvested acreage in 1970.

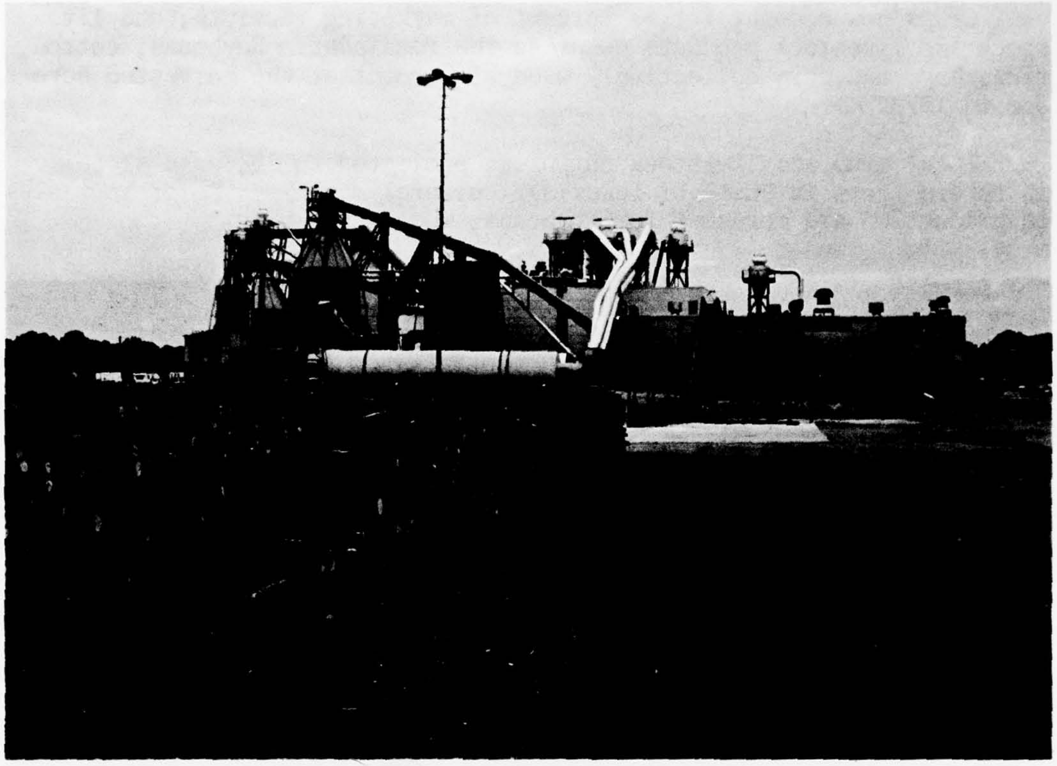
Total crop and livestock output is projected to increase steadily in future years in spite of fewer agricultural workers. Major increases in production are forecast for soybeans, wheat, and rice.

Livestock and livestock products are a major agricultural enterprise in the region.

Since nearly 64 percent of the surface area of the region was classed as suitable for agricultural crop use in 1970, the potential exists for even greater production increases than are projected, should needs arise.

Forestry

Forests and their products have always played an important role in the development of this area. In 1970, 29.6 million acres, or nearly 45 percent of the region, was forested even though a loss of 7 percent of the forest land acreage has occurred since 1949. The loss would have been greater without reforestation practices; WRPA's 3, 5, and 7, for example, have actually shown an increase in forest acreage.



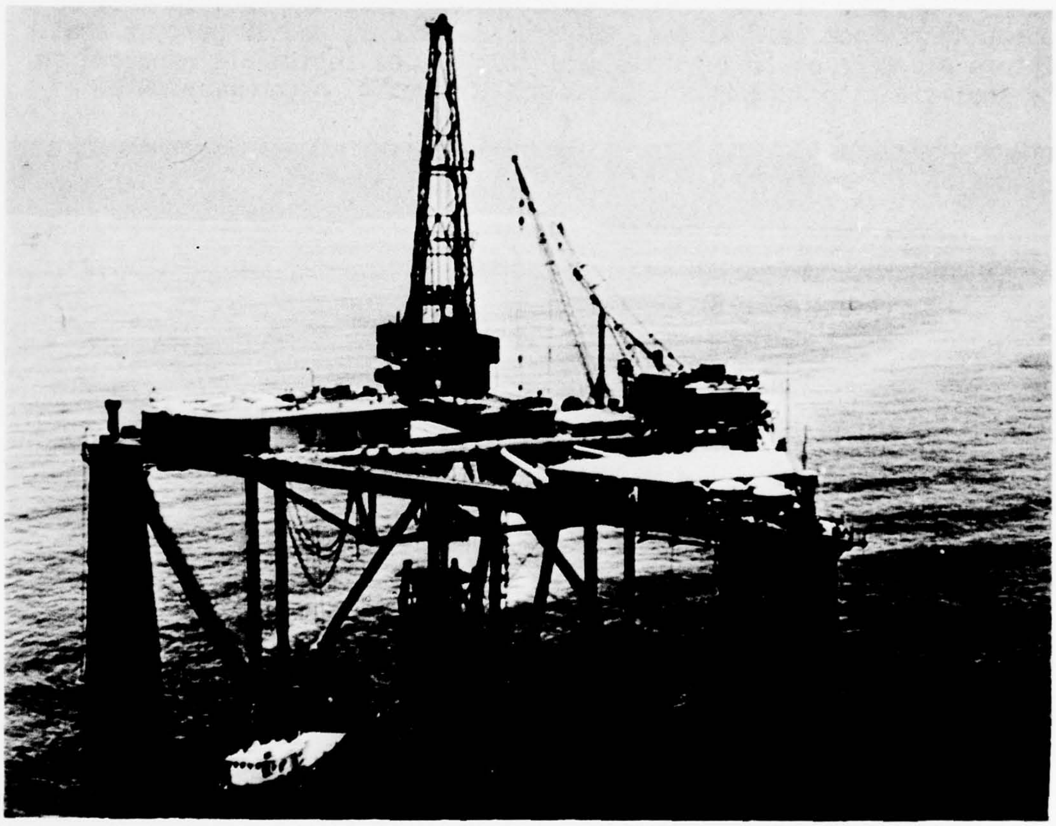
The wood products industry is an important part of the regional economy.

Some 860 million cubic feet of industrial roundwood were harvested from the forestland in 1970. Over half of this was softwood - mainly pine. Pulpwood and sawlogs accounted for over 70 percent of the harvest. In terms of volume of wood processed, sawlogs led the product list and pulpwood rated second.

Industrial consumption of 558 million cubic feet of roundwood in 1970 will increase to 1.3 billion cubic feet by 2020. Total wood consumption by the region's pulp paper and allied products industry is expected to expand fivefold, with WRPA 5 remaining the most important pulpwood-producing area. The need for lumber in the United States is projected to increase some 22 percent between 1962 and 1985; and the included need for plywood and veneer is predicted to double. The Lower Mississippi Region, presently realizing but half of its timber growing potential, is expected to supply an increasing share of this future market. Its timber resource will thus become increasingly important in meeting growing national needs.

Mining

In 1969 regional mineral production accounted for a substantial part of the Nation's liquid and gaseous fuels - specifically, 34 percent of the natural gas output, 31 percent of the natural gas liquids, and 25 percent of the petroleum. Furthermore, the region contributed one-fifth of the Nation's lead and bromine, one-third of its salt, and two-thirds of its sulfur. The total mineral production in the region was valued at $4.7 billion (in 1967 dollars) up from $1.3 billion in 1956, a dramatic increase of 260 percent in 13 years!

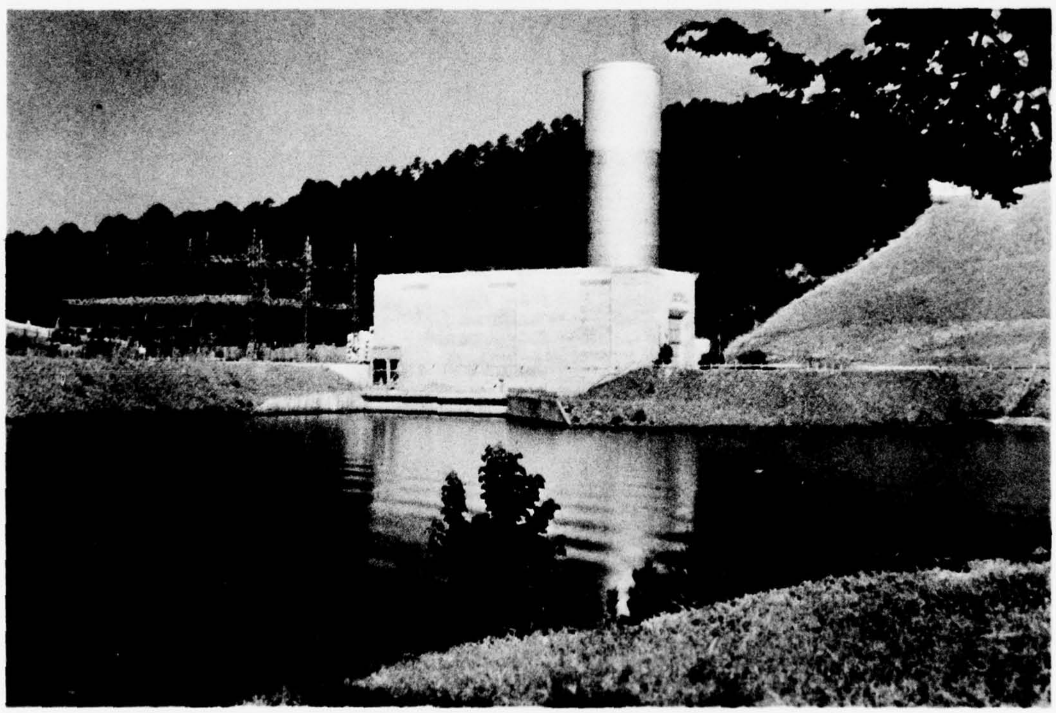


Drilling for offshore oil.

The value of regional mineral fuels output is expected to increase between 100 and 200 percent by 2020. Value of metallic minerals will double, while that of nonmetallic minerals will triple or quadruple. Much of the sharp increase in nonmetallic mineral output is attributable to an expected upturn in salt and sulfur production in the coastal area.

Electric Power

In the 10-year period ending in 1965, demands for peak electric power in the region's power market area increased at a compound annual growth rate of 10.9 percent. This rate is estimated to decrease gradually to 7.9 percent between 1980 and 1990. Current industrial energy use is by far the largest in terms of classified sales and will represent half of total area requirements by the year 1990. Power requirements in 1980 and 1990 will be met principally by thermal power plants, both fossil and nuclear fueled. At present, 95 percent of the fuel for thermal generation in the region's market area is natural gas, and the other 5 percent is coal. It is expected the fuel mix in 1990 will be about 46 percent natural gas, 43 percent nuclear, and 10 percent coal. Future electric power supplies available to the region are expected to be sufficient to support the anticipated level of economic growth.



Blakely Mountain Power Plant, Ouachita River, Arkansas (WRPA 5).

Manufacturing

Although manufacturing is relatively less important to the regional economy than to the national economy, its regional importance is increasing. In 1968 manufacturing earnings of $2.6 million (1967 dollars) comprised 21 percent of total regional earnings (up 4.2 percent in

20 years). Nationally, the figure was 29 percent. The region's share of the national manufacturing earnings increased from 1.3 percent to 1.6 percent between 1950 and 1968.

Six manufacturing industries contributed more to the 1968 regional economy than they did to the national economy. These industries accounted for about 56 percent of total manufacturing earnings. In terms of individual contributions to that percentage, they ranked as follows: Food and kindred products (12.7); lumber and furniture (11.9); chemicals (11.6); paper and allied products (7.6); apparel (6.6); and petroleum refining (6.0).

Manufacturing activity is unevenly distributed among the WRPA's. The Memphis area (WRPA 3) accounted for 29 percent of total 1968 regional manufacturing; the Ouachita area (WRPA 5) had 13 percent; the New Orleans area (WRPA 10) contributed 18 percent; and the Baton Rouge area (WRPA 8) produced 10 percent. Other areas varied from 1 percent (WRPA 6) to 8 percent (WRPA 4).

Recreation

Regional personal expenditures for vacations and other outings jumped from $350 million to $600 million annually during the 1960's. Projected increases in per capita purchasing power and more leisure time are expected to intensify the need for recreational services and facilities. A unique opportunity exists for extensive development of communities oriented to water recreation. In recent years, more industries have been locating in areas that have easy access to outdoor recreational sites.

Service Industries

Increased productivity per worker and increased per capita incomes will greatly expand the demand for services. During recent decades, expansion in the service or noncommodity industries has been at a higher rate than the strictly commodity-producing industries. By 1960 two-thirds of all employment in the region as well as in the Nation was in the noncommodity area.

Forecasts are that employment and earnings in the service industries will grow at a slightly higher rate than in manufacturing. Specifically, earnings by 2020 will expand 11 times in the service industries as compared to 8 times in manufacturing.

Swimming is a popular outdoor recreational activity for children and adults throughout the region.

RESOURCE AVAILABILITY

General

The Lower Mississippi Region can be considered water-rich. It not only receives abundant rainfall that replenishes ground water and feeds its many interior streams and lakes, but also has vast untapped ground-water reserves. Moreover, there is tremendous inflow to the region from the huge drainage system of the Upper Mississippi River and tributaries and from the Arkansas, White, and Red Rivers. However, the fact that the region has been endowed with a plentiful supply of water does not mean that it is without management problems. A major thrust of this appendix is aimed at highlighting these problems and formulating measures for their solution.

The region has a total area of over 65 million acres, including nearly 3 million acres of surface water. Almost all of the region's resources of flowing water, surface water, and land are suitable for one or more uses.

Water Resources

Surface Water

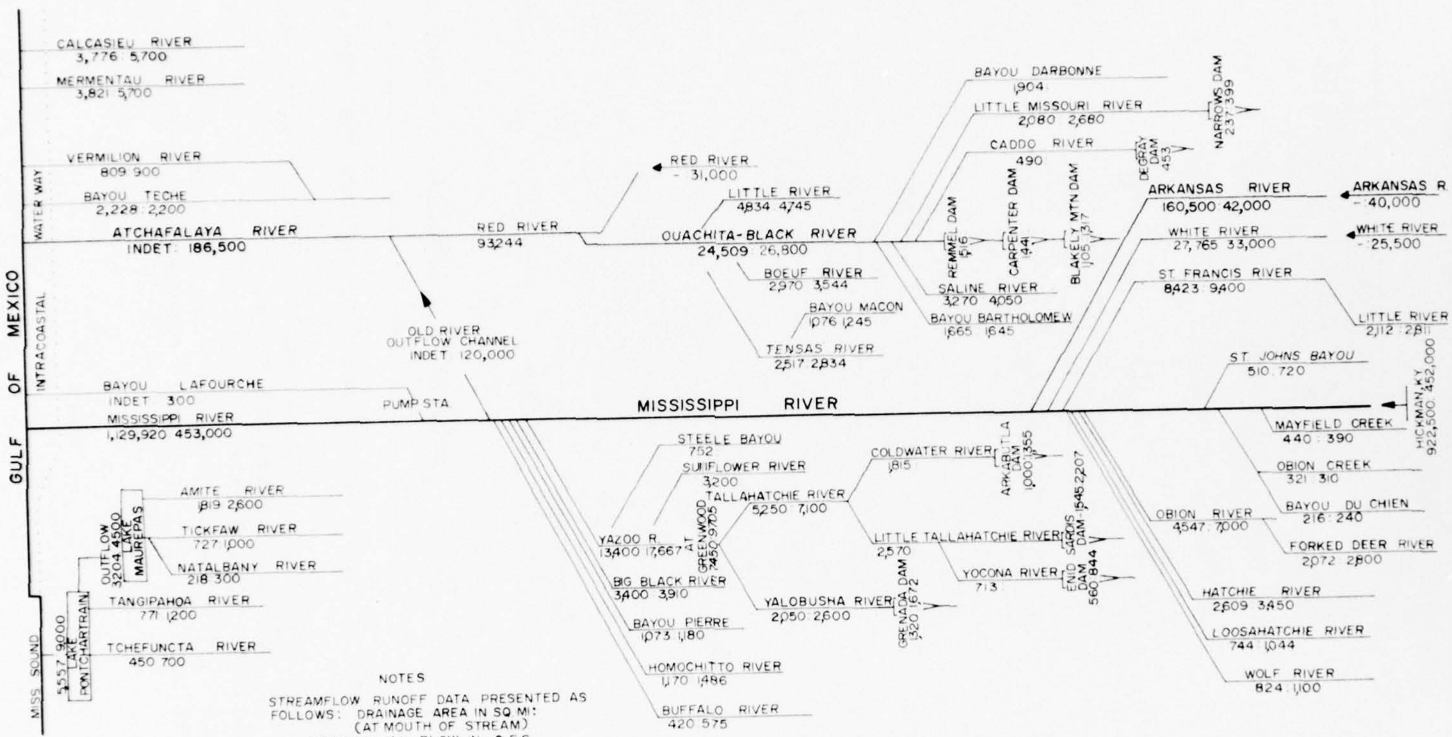
The region's water supply is derived from precipitation, streamflow from external sources, and man-induced or natural ground-water discharges from aquifers both within and outside the region. Water not consumed within the study area ultimately flows into the Gulf of Mexico or returns to the atmosphere by evaporation or transpiration.

Volume. Annual precipitation averages about 52 inches, with lesser amounts in the northern part of the region and greater amounts along the Gulf coast. Slightly over two-thirds of all regional precipitation either infiltrates the soil or returns directly to the atmosphere through evapotranspiration. However, a yearly average of 16.4 inches reaches the surface water supply in the form of runoff. This amount of runoff is equivalent to a mean annual discharge of nearly 80,000 m.g.d. An additional 292,000 m.g.d. is contributed to the region from the Upper Mississippi and Ohio tributary basins and about 62,000 m.g.d. is contributed from the Arkansas, Red, and White Rivers from their drainages outside the region. Thus, the region's combined mean annual inflow amounts to about 434,000 m.g.d. Surface water losses due to various consumptive uses, namely ground-water recharge and evapotranspiration, are balanced by additions from ground-water withdrawals or natural discharges to the extent that the measured mean annual outflow to the Gulf is about 433,000 m.g.d. The difference between inflow and measured outflow is accounted for by unmeasured discharges to the Gulf through salt and brackish marshes along the coast (primarily WRPA's 9 and 10).

Figure 4 schematically illustrates the regional stream system, giving drainage areas in square miles and related discharges in c.f.s. Flow rates are given in c.f.s. because this is the common practice. A conversion to m.g.d. can easily be made by multiplying the flow in c.f.s. by 0.646.

Water supply from rivers and streams varies considerably when considered on the basis of percent of time a given flow is available. Only a small part of this flow can be stored for use; and due to the probable dislocations of the resource with respect to possible points of need for some water uses, a more stringent examination of flows within each planning area is required to assess the practical useability of the streamflow. The reliability of streamflow is an important factor in its evaluation as a source for meeting any specified withdrawal need. Failure of supply criteria is normally based on dry weather flows. These are low flows of a stream for a specified duration of time. Failure criteria are usually expressed in terms of the lowest mean 7-day discharge with a recurrence interval of either 30 years (7-day Q_{30}) or 10 years (7-day Q_{10}). The longer interval is normally used in planning withdrawals for critical uses such as municipal water supply. The 10-year period is used in stream pollution analyses. Table 3 provides a comparison of flow versus percent of time available by planning area and for the region. Table 4 provides low-flow information for each planning area and the region.

The region discharges an average of 433,000 million gallons of water per day into the Gulf of Mexico. Approximately two-thirds of this flow is discharged through the Mississippi River.



NOTES

STREAMFLOW RUNOFF DATA PRESENTED AS FOLLOWS: DRAINAGE AREA IN SQ MI (AT MOUTH OF STREAM) MEAN ANNUAL FLOW IN C.F.S (AT MOUTH OF STREAM)

FLOWS AT MOUTHS OF STREAMS ARE ESTIMATED BY DRAINAGE AREA RELATIONSHIP

DUE TO CROSS FLOWS AT VARIOUS STAGES DRAINAGE AREAS AT SOME LOCATIONS ARE INDETERMINATE.

SUM OF INFLOWS + GENERATED FLOWS DO NOT EXACTLY BALANCE OUTFLOWS FROM THE REGION DUE TO OMISSION OF FLOWS ORIGINATING IN THE SALT TO BRACKISH MARSHES ALONG THE COAST.

LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY
WATERSHED AREA AND
RUNOFF DIAGRAM
THE REGION

Figure 4

Table 3 - Mean Annual Discharge, 1973 Conditions, Lower Mississippi Region

WRPA	Area Square Miles	Flows in Area (c.f.s.) Mean Annual	Exceedence in Percent of Time 80	90	95
1	2,435	453,000 1/	260,000 1/	200,000 1/	170,000 1/
2	16,723	19,770 2/	5,898 2/	4,635 2/	3,999 2/
3	10,653	13,810	2,412	1,996	1,761
4	13,355	17,670	5,550	3,590	2,490
5	20,413	20,440 3/	2,750 3/	1,690 3/	1,245 3/
6	5,520	6,350	580	349	255
7	6,574	7,740	870	677	596
8	5,705	5,700	1,700	1,500	1,400
9	13,297	14,500 4/	4,600 4/	3,300 4/	2,600 4/
Atchafalaya River Outlets	--	186,500	72,800	52,000	41,600
10	7,729	11,400	2,600	1,400	800
The Region	102,404	Flows Generated 123,950	26,960	19,137	15,146
		Measured Flows Thru Region 671,100	341,700	258,200	216,400

1/ Flow for Mississippi River at mouth including inflows into the area from other areas.
2/ Does not include contributions from Arkansas and White River Basins above backwater effects of Mississippi River.
3/ Does not include flows from WRPA 6.
4/ Does not include contributions from Red River Basin above backwater effects of Mississippi River, or flows generated within Atchafalaya Floodway.

Table 4 - Dry Weather Low-Flow Summary, Lower Mississippi Region

WRPA	Area Square Mile	Originating Within Region 7-day Q_{10} (m.g.d.)	Originating Within Region 7-day Q_{30} (m.g.d.)	Tributary to Region 7-day Q_{10} (m.g.d.)	Tributary to Region 7-day Q_{30} (m.g.d.)	Total 7-day Q_{10} (m.g.d.)	Total 7-day Q_{30} (m.g.d.)
1 1/	2,435	78	69 2/	71,096 3/	58,815 3/	71,174	58,884
2	16,723	706	595	5,113 4/	4,258 4/	5,819	4,853
3	10,653	811	701	-	-	811	701
4	13,355	795	653	-	-	795	653
5	20,413	530	394	1,034 5/	743 5/	1,564	1,137
6	5,520	81	58	-	-	81	58
7	6,574	213	187	-	-	213	187
8	5,705	491	437	-	-	491	437
9	13,297	187 6/	160 6/	-	-	187	160
10	7,729	95	84	-	-	95	84
LMR	102,404	3,987	3,338	77,243	63,816	81,230	67,154

1/ The flow in WRPA 1 which is available for use at its lower end is much larger than the flows shown.
2/ Estimated.
3/ Flow from upper Mississippi and Ohio Rivers.
4/ Flow from upper Arkansas and White Basins.
5/ Flow from upper Red River Basin.
6/ Does not include flow in Atchafalaya River which is made up of flows included in WRPA's 1, 5, and 6 (including flows entering the region in the Red River).

Areal Distribution. The region's surface water resource covers a total of 3,067,000 acres. This includes 1,082,000 acres of large lakes (500 acres or more in size) within WRPA's 2 through 10, 1,148,000 acres distributed among small lakes (40 acres or greater but less than 500 acres in size) and streams having a width of one-eighth mile or greater, which includes the Mississippi River and its oxbow lakes. The remaining 837,000 acres of water surface, classified as small water, includes lakes between 2 and 40 acres in size and streams less than one-eighth mile wide. Some of the lakes are large man-made reservoirs; two were formed by an earthquake, and numerous others are oxbow lakes formed naturally by meandering rivers. Almost all of the region's water surface is suitable for certain recreation activities, fishing, and wildlife habitat. Much of the surface water serves commercial navigation purposes. About 474,000 acres of lakes and streams with waters of good quality enhance the environment of the region, and the entire length of the Mississippi River is highly valued as an environmental quality resource.

Table 5 provides a breakdown of the surface water resource by planning area.

Table 5 - Water Surface Availability, Lower Mississippi Region

	Water Surface (1,000 acres)		
WRPA	Large Water	Small Water	Total
1	368	-	368
2	91	98	189
3	40	32	72
4	74	133	207
5	175	76	251
6	32	40	72
7	38	56	94
8	73	45	118
9	400	138	538
10	939	219	1,158
LMR	2,230	837	3,067

The region has 29 major reservoirs (individual storage capacity at least 5,000 acre-feet) with a combined storage capacity approaching 10 million acre-feet. About 7 million acre-feet of this total storage, which will yield nearly 6,300 m.g.d., can be controlled for specific uses. Table 6 summarizes the existing storage capability of these reservoirs. The effects of this storage on streamflow are reflected in preceding discharge data.

The region contains numerous sites which have a potential for development of additional storage. However, due to the area's terrain features, only a small portion of total streamflow can be economically impounded. Total dependable yield from all potential impoundment sites is somewhere in the range of 7,000 to 10,000 c.f.s., or approximately 4,500 to 6,500 m.g.d.

Table 6 - Existing Storage in Impoundments, Lower Mississippi Region

WRPA	Total Storage (Ac-ft.)
1	-
2	582,000
3	6,000
4	4,092,600
5	4,799,100
6	20,500
7	0
8	0
9	39,600
10	0
LMR	9,539,800

Ground Water

Aquifers containing fresh ground water underlie the entire region except for part of the coastal area of Louisiana and a small area in central Louisiana. About 80 percent of these aquifers are capable of yielding large volumes of fresh water. Highest yields can be obtained from sand and gravel alluvial and terrace deposits of Quaternary age. Yields of several thousand gallons of water per minute are not uncommon. Wells provide most of the public and industrial water supplies in the region because ground water of good quality is generally available where needed.

Test drilling in one of the region's fresh water aquifers.

In a few localized areas, ground-water demands have exceeded or are approaching the economically practicable limit of available supply, but in most of the region the water-supply potential is several times larger than present requirements. The region's total dependable ground-water supply is conservatively estimated at about 16,000 million gallons per day. This estimate is based on withdrawals consistent with economically and environmentally acceptable water-level declines.

Table 7 shows estimated yield of the ground-water resource on a WRPA basis. Yields from WRPA 1 are included with adjacent WRPA totals.

Table 7 - Available Ground-water Resource, Lower Mississippi Region

WRPA	Non-Artesian Aquifers (m.g.d.)	Artesian Aquifers[1/] (m.g.d.)	Total (m.g.d.)
2	3,155	661	3,816
3	370	769	1,139
4	1,720	343	2,063
5	2,495	249	2,744
6	1,932	55	1,987
7	116	155	271
8	414	540	954
9	595	2,014	2,609
10	46	310	356
Total	10,843	5,096	15,939

1/ Based on flow-through produced by hydraulic gradient resulting from an average drawdown of 200 feet during a 50-year period.

Land Resources

General

The lands of the Lower Mississippi Region can support a diverse range of land-dependent activities. Much of this capability is directly related to the region's abundant precipitation and climate. Bumper dry-land crops are consistently produced on its rich delta soils without requiring irrigation projects. Forty-seven percent of the region is forested, with both fast-growing pine and high quality bottom-land hardwoods covering extensive tracts. The region's land cover supports a bountiful and diverse wildlife resource, some species of which are more numerous today than they were prior to the region's first European visitors. Natural landscape features vary from broad prairie-like alluvial plains to gently undulating pastured hills to steep wooded slopes of

low mountain ranges. Land use is perhaps the best indicator of the state of development of the land resource. In 1970, 62,471,000 acres of the region's area supported land uses while 3,067,000 acres were covered by water. About 43 percent of the land portion of the study area was used primarily for growing crops and raising livestock and an additional 14 percent, although forested, was also used for grazing livestock. There were over 2 million acres occupied by towns and cities, with the largest urban centers located on the banks of the Mississippi River. Table 8 gives a breakdown of current land uses in the region.

Table 8 - Land Use, 1970, Lower Mississippi Region

Land Classification	Land Use: Purpose 1/	Land Use: Acres	Percent of Region's Land
Cropland	A,WL	17,343,000	28
Permanent Pasture	A,WL,R	6,782,000	11
Pastured Cropland	A,WL,R	2,871,000	4
Pastured Forest	FP,A,WL,R	(4,207,000)	
Forests	FP,WL,R	29,637,000 2/	47
Other	A,WL,CF,MP, EQ,MS,R	3,506,000 3/	6
Urban and Built-up	RSD,CML,I,T, R,EQ	2,332,000	4
Total Lands		62,471,000	100

1/ A, agricultural production; WL, wildlife habitat; R, recreation; EQ, environmental quality; CF, commercial fisheries; MP, minerals production; MS, miscellaneous uses; RSD, residential; CML, commercial; I, industrial; T, transportation facilities; FP, Forest products.
2/ Includes pastured forests.
3/ 1,287,000 acres counted in agricultural land base.

Agricultural Capability

The agricultural capability of the region's resource is a function of soil properties and other factors that vary geographically. Based on such factors, comparable land areas have been grouped by standard capability classifications, using the Conservation Needs Inventory developed by the Soil Conservation Service, USDA. Within the total agricultural land base of 57.9 million acres, there are about 36 million acres of Class I, II, and III lands suited for use as regularly cultivated cropland, pasture, forests, range, and wildlife food production and cover, with only minimal limitations. An additional 5.5 million acres of Class IV lands are suited to the same uses, but their crop yields are usually low and only two or three crop types may be successfully grown. Class IV lands are considered unsuitable for regular or every-year cultivation. About 7.8 million acres of marginal land in Classes V and VI are not well suited to cultivation but are better able to support uses such as pasture, range, forests, and wildlife food production and cover. Similarly, there are 6.8 million acres of Class VII land that are considered unsuitable for cultivation and pasture. These lands were used for grazing, forest, or wildlife food production and cover in 1970. The remaining 1.6 million acres of agricultural land fall within Class VIII and are considered best suited for recreation, wildlife, or esthetic purposes. A breakdown of the agricultural land resource base by capability is presented in table 9.

Table 9 - Capability of Agricultural Land, Lower Mississippi Region

Classification1/	Acreage	Excluded Use2/
Classes I through III	36,125,232	None.
Class IV	5,546,830	None, except number of crop types severely limited and productivity lower.
Classes V and VI	7,816,003	Cultivation.
Class VII	6,804,858	Cultivation, Improved pasture.
Class VIII	1,627,077	Cultivation, Pasture, Range, Grazing.
Total	57,920,000	

1/ For definition, see Appendix F.
2/ By virtue of capability.

On-farm ponds less than 2 acres are included in the land resource base. The above farm is typical of many in the region.

RESOURCE USE AND FUTURE NEEDS

Present (1970) resource use and future needs for water and related land resources in the Lower Mississippi Region are discussed in this section. Consistent with the main theme of the appendix, the discussion is tailored to four broad categorizations: (1) water withdrawals or supply, (2) water surface area, (3) land area, and (4) related problems. The future needs in each category are summarized for both Program A (National Income) and Program B (Regional Development).

Water Withdrawals

In 1970 nearly 20 billion gallons of water per day (19,767 m.g.d.) - enough to serve the requirements of 250 cities the size of Tulsa, Oklahoma - were withdrawn from this region's surface and ground-water supplies for various uses. Of the total withdrawals, 8 billion gallons per day (8,194 m.g.d.) were consumptively used. The 1970 use and projected needs for 1980, 2000, and 2020 are discussed first by individual use categories and then summarized for the region.

Municipal Water Supply

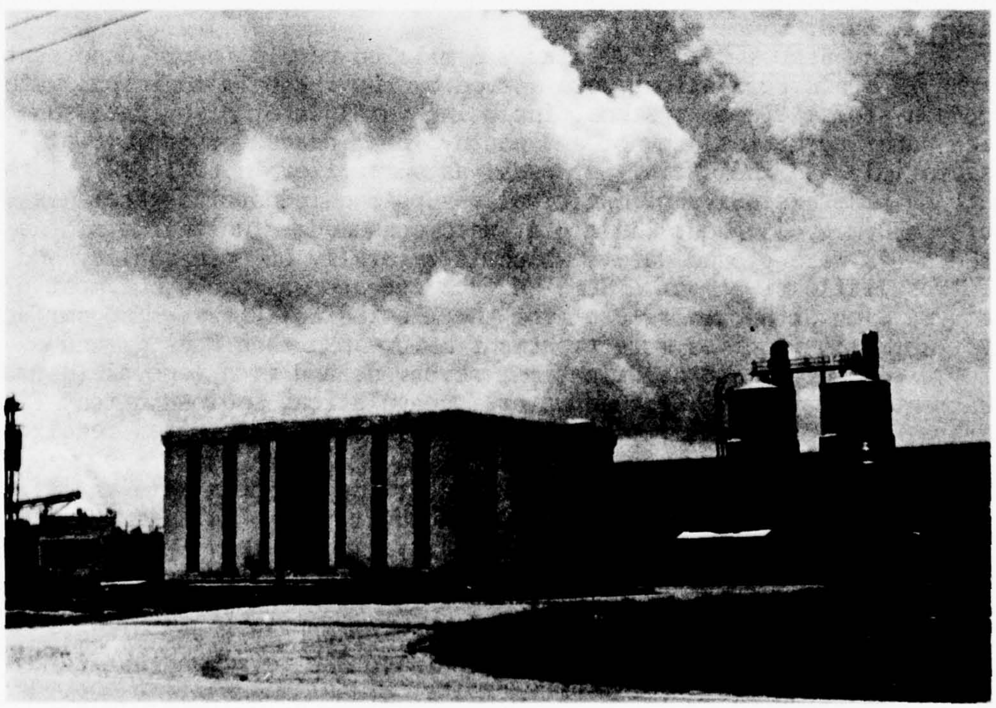
Present Status. In 1970 nearly 5 million people (over 70 percent of the region's population) were served by the region's municipal water supply systems. These systems, including rural water districts, supplied water to cities, towns, and nearby rural areas for commercial, residential, and industrial purposes, as summarized in table 10. Total municipal use exclusive of municipally supplied industrial water was nearly 620 m.g.d. About 230 m.g.d. were consumed. Two-thirds of the withdrawals were ground water, which is generally of good quality and requires little treatment. Some surface storage was used, but most of the remaining withdrawals were from the Mississippi River. The surface water normally requires more treatment before use than does ground water. In addition to chlorination, aeration, and iron removal (normal treatment practices for ground water), coagulation, sedimentation, filtration, taste and odor removal, and sterilization were often required.

For the most part, all municipal water supply needs were satisfied without noticeable shortages in 1970. However, there were some isolated problems unrelated to resource availability. The water supply pumping system in some small urban centers such as Dyersburg, Tennessee, had insufficient capacity to meet peak demands. Land subsidence and salt-water intrusion is taking place in portions of WRPA's 8 and 9 where significant drawdown of aquifers is occurring due to ground-water withdrawals.

Future Needs. In the next 50 years municipal water supply requirements are expected to increase faster than population growth for two reasons: (1) An upward trend in the per capita use rate is foreseen,

Table 10 - Municipal Water Use, 1970, Lower Mississippi Region

WRPA	1970 Withdrawal (m.g.d.) Ground Water	Surface Water
2	32.7	2.1
3	141.8	0.0
4	53.8	0.0
5	37.5	16.8
6	7.5	0.6
7	12.0	0.0
8	54.5	0.7
9	65.1	6.9
10	5.8	178.9
LMR	410.7	206.0



In 1970 over 70 percent of the region's population was served by municipal water supply systems such as this facility at Vicksburg, Mississippi. In the future a higher percentage of the region's residents will rely on such systems for water supply.

and (2) Past shifts from individual rural wells to municipal systems or organized rural systems are likely to continue. Table 11 provides a summary of present use and future municipal water withdrawal needs and estimated consumption by WRPA for Programs A and B.

Industrial Water Supply

Present Status. As the region's leading water user in 1970, industry withdrew in excess of 5,000 m.g.d. for various manufacturing processes. Petroleum refining - requiring more water than any other manufacturing activity - and the allied chemical industry were concentrated in the southern WRPA's of 8, 9, and 10. Paper and allied products industries, also heavy users of water, were more widely dispersed. Their biggest withdrawals were in WRPA's 5 and 7. Most of the water withdrawals for food and kindred products were in WRPA's 2, 3, 9, and 10. Industries using less significant amounts of water were those processing textiles and those extracting and processing metals (primarily in WRPA 2).

In 1970 industries withdrew more water from the region's supplies than any other user. Most water used was taken from the Mississippi River.

Table 11 - Summary of Present Use and Future Municipal Water Withdrawal Needs, Lower Mississippi Region (m.g.d.)

	1970			1980		2000		2020	
WRPA	Withdrawal	Consumption	Program	Withdrawal	Consumption	Withdrawal	Consumption	Withdrawal	Consumption
2	34.8	12.9	A	40.1	14.7	56.6	21.2	82.6	30.9
			B	43.1	15.8	63.4	23.6	96.1	35.9
3	141.8	52.7	A	175.7	64.6	278.1	103.3	408.8	152.3
			B	192.9	71.0	316.0	117.5	474.5	176.8
4	53.8	20.0	A	65.7	24.2	89.8	33.4	123.7	46.1
			B	71.9	26.4	101.8	37.8	140.4	52.4
5	54.3	20.2	A	65.9	24.2	89.8	33.4	133.8	49.9
			B	70.0	25.8	101.9	37.9	152.2	56.8
6	8.1	3.0	A	9.1	3.4	11.4	4.2	14.7	5.5
			B	9.8	3.6	11.9	4.4	16.2	6.1
7	12.0	4.5	A	15.3	5.6	22.1	8.2	32.8	12.2
			B	17.0	6.2	25.7	9.5	38.3	14.3
8	55.2	20.5	A	72.1	26.5	108.6	40.4	157.5	58.8
			B	77.7	28.6	121.5	45.2	178.8	66.7
9	72.0	26.8	A	92.0	33.7	126.2	47.0	167.7	62.5
			B	98.2	36.2	142.9	53.3	188.9	70.6
10	184.7	68.4	A	220.3	81.1	310.1	115.3	428.2	159.7
			B	237.8	87.5	345.9	128.7	485.9	181.2
LMR	616.7	229.0	A	756.2	278.0	1,092.7	406.4	1,549.8	577.9
			B	818.4	301.1	1,231.0	457.9	1,771.3	660.8

About 85 percent of the water used by industry in 1970 was taken from surface sources, primarily the Mississippi River. Nearly 1,060 m.g.d., or roughly 20 percent, of this withdrawal was from brackish sources.

In WRPA's 8, 9, and 10 in Louisiana are concentrated major water-using industries. It is these areas that accounted for almost 90 percent of the total industrial withdrawals in 1970.

Table 12 shows 1970 industrial water use for the region by WRPA and source of withdrawal. Consumptive use was about 36 percent of withdrawals and there were no reported shortages of water, even though supplies were not always available from the cheapest or most preferred source.

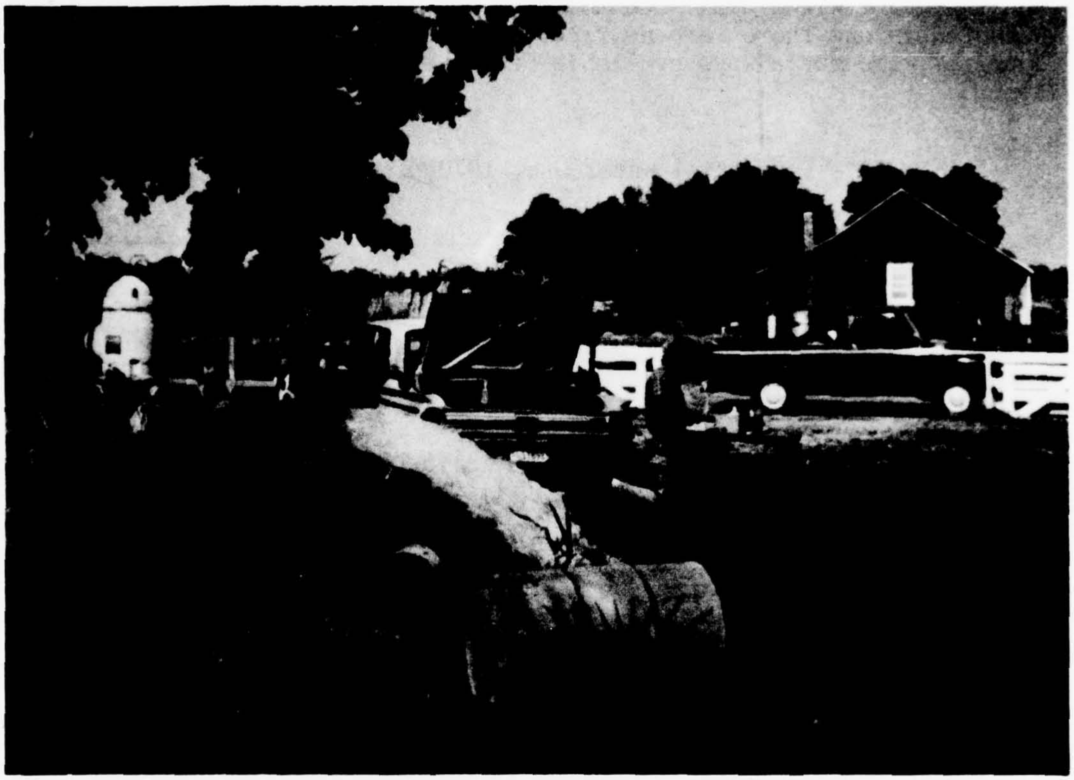
Table 12 - Industrial Water Use, 1970, Lower Mississippi Region

	Water Withdrawals (m.g d.)		
		Surface Water	
WRPA	Groundwater	Fresh	Brackish
2	33.7	5.1	-
3	94.6	3.5	-
4	49.1	37.5	-
5	119.3	87.4	-
6	28.4	33.1	-
7	73.1	0.5	-
8	159.3	1,352.2	2.7
9	237.8	39.4	1,024.3
10	26.3	1,981.6	30.9
LMR	821.6	3,540.3	1,057.9

Future Needs. Because of the vast supplies of water available for industrial use and because of the water transportation system, regional economic growth is predicted to increase dramatically in future years.

Percentagewise, the expected increases in water supply requirements are greatest in the chemical industry, followed by the paper and allied products group. Collectively, the industrial water use of 1970 is foreseen to increase eight or nine times by the year 2020. Program A projections point to the lesser increase. The region's 1970 industrial water use, future withdrawal needs, and estimated consumption by WRPA are summarized in table 13.

Rural Domestic Water Supply



Most water used by rural residents in 1970 was withdrawn from wells such as the one shown above. In the future, an increasingly higher percentage of rural water supply needs will be satisfied by municipal systems or organized rural water districts.

Present Status. Water counted as withdrawals for rural domestic use in 1970 amounted to almost 122 m.g.d. Most of this water came from individual wells, but a sizable segment of the rural population was served by the extension of municipal water systems or by rural water districts. About 27 percent of the region's population obtained domestic

Table 13 - Summary of Present Use and Future Industrial Water Withdrawal Needs, Lower Mississippi Region
(m.g.d.)

	1970			1980		2000		2020	
WRPA	Withdrawal	Consumption	Program	Withdrawal	Consumption	Withdrawal	Consumption	Withdrawal	Consumption
2	38.8	15.1	A	58.3	23.5	142.8	57.2	332.0	132.9
			B	64.0	25.6	164.8	65.8	391.2	156.4
3	98.1	14.6	A	149.5	22.2	351.2	52.0	800.6	118.5
			B	163.8	24.1	398.1	58.6	944.2	139.6
4	86.6	7.1	A	135.5	9.9	320.4	21.6	729.3	46.6
			B	148.6	10.9	370.6	25.1	859.7	54.9
5	206.7	68.2	A	307.4	101.0	683.9	224.5	1,497.8	486.0
			B	345.9	115.3	808.5	266.5	1,803.5	589.0
6	61.5	6.5	A	71.3	8.3	135.9	17.1	261.3	35.0
			B	78.9	9.3	157.2	19.8	306.8	41.2
7	73.6	6.0	A	105.5	10.1	235.0	24.3	509.1	55.3
			B	114.9	10.5	263.0	25.5	575.1	57.6
8	1,514.2	386.7	A	2,261.3	627.5	5,668.5	1,771.6	13,840.9	4,487.1
			B	2,480.2	687.8	6,548.8	2,049.1	16,322.3	5,292.0
9	1,301.5	230.7	A	2,047.4	347.8	4,745.0	771.7	10,780.8	1,676.7
			B	2,244.8	381.3	5,486.6	895.3	12,714.3	1,977.5
10	2,038.8	110.6	A	3,072.1	157.7	7,707.8	359.2	18,426.5	805.1
			B	3,367.1	172.8	8,915.0	415.3	21,731.4	949.2
LMR	5,419.8	845.5	A	8,208.3	1,308.0	19,990.5	3,299.2	47,178.3	7,843.2
			B	9,008.2	1,437.6	23,112.6	3,821.0	55,648.5	9,257.4

water supplies from individual wells in 1970. Table 14 provides pertinent information on the present rural domestic water use. The rural population given in the table is about 27 percent of the total population of the region. The indicated water use is all consumptive.

Table 14 - Rural Domestic Water Use, 1970, Lower Mississippi Region

WRPA	Rural Population: Total	Rural Population: Supplied by Individual Wells	Water Use (m.g.d.)
2	376,000	309,000	24.7
3	377,000	241,000	22.7
4	402,000	271,000	21.7
5	419,000	201,000	16.1
6	115,000	84,000	6.7
7	111,000	65,000	5.2
8	230,000	118,000	4.5
9	314,000	247,000	16.8
10	222,000	159,000	3.5
LMR	2,566,000	1,695,000	121.9

Future Needs. A general decline in rural domestic water needs is expected but there will be some deviation from this trend. The decline will result from a continuous shift of rural population to urban areas and the continued development of rural public water supply systems (counted as municipal systems). Withdrawals to meet the rural domestic water needs in 2020 are predicted to average between 70 and 80 m.g.d. This is 34 to 39 percent less than the 1970 withdrawals for this use and less than 1 percent of the combined projected 2020 withdrawals for municipal, industrial, and thermoelectric power uses. Present use and future rural domestic water supply needs are summarized in table 15.

Table 15 - Summary of Present Use and Future Rural Domestic Water Withdrawal Needs, Lower Mississippi Region

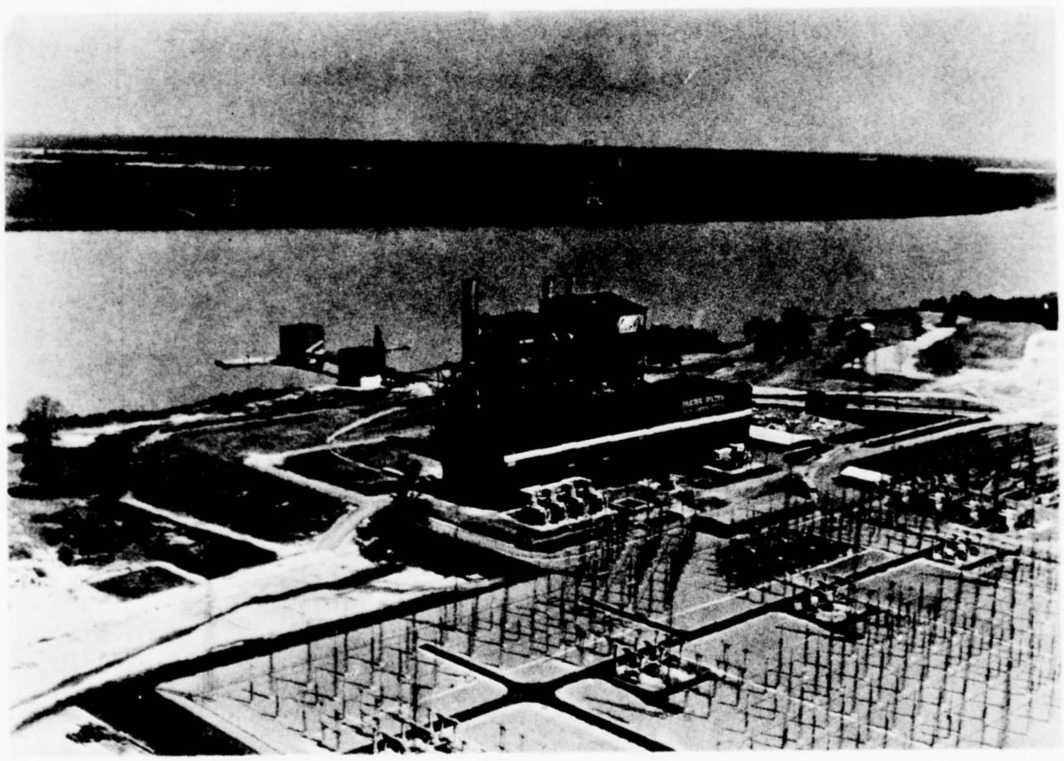
WRPA	Existing (1970) Use 1/	Program 2/	Future Water Withdrawals, m.g.d. 1980	2000	2020
2	24.7	A	20.6	16.0	10.6
		B	22.3	17.7	12.2
3	22.7	A	20.0	14.3	11.9
		B	22.0	16.2	13.9
4	21.7	A	18.9	14.7	11.1
		B	20.6	16.7	12.6
5	16.1	A	14.4	12.2	5.5
		B	15.3	13.9	6.3
6	6.7	A	5.2	3.9	2.7
		B	5.6	4.0	2.9
7	5.2	A	4.6	3.4	1.9
		B	5.1	4.0	2.2
8	4.5	A	4.9	6.1	8.4
		B	5.3	6.9	9.5
9	16.8	A	15.1	14.7	14.7
		B	16.1	16.7	16.5
10	3.5	A	5.4	6.2	5.1
		B	5.8	7.0	5.7
LMR	121.9	A	109.1	91.5	71.9
		B	118.1	103.1	81.8

1/ All 1970 withdrawals for rural domestic purposes were considered to be consumptively used. The same applies to future withdrawals for this purpose.

2/ Program A, National Income; Program B, Regional Development.

Thermoelectric Power Water Supply

Present Status. Thermoelectric power production in 1970 ranked third in use of the region's water, with withdrawals of over 4,500 m.g.d. Practically all (98 percent) of these withdrawals were taken from surface sources, which included both fresh and brackish water, and were used almost totally for once-through cooling. Only about 3 percent was consumed as boiler make-up water. For dissipation of heat, plants used once-through cooling, cooling towers, cooling ponds, or some combination of these. There were no reported shortages of cooling water. Table 16 provides data on thermal plants in the region, their water use, and their 1970 source of supply.



Power generation required vast amounts of cooling water in 1970. This need for cooling water will more than quadruple in the next 50 years.

Future Needs. Thermoelectric water use requirements are expected to increase 417 percent under Program A growth rates or 488 percent under Program B growth rates by the year 2020. The increase in future requirements varies considerably among WRPA's, with some exhibiting relatively great increases while others show no gains by 1980. Table 17 contains data on present withdrawals, future needs, and consumption for thermoelectric power generation.

Table 16 - Thermoelectric Power Production Cooling Water Use in 1970, Lower Mississippi Region

WRPA	Ground Water Number of Plants	Ground Water Withdrawals (m.g.d.)	Surface Water Number of Plants	Surface Water Withdrawals (m.g.d.)	Total Number of Plants	Total Withdrawals (m.g.d.)
2 1/	3	5.0	4 2/	394.0	7	399.0
3	-	-	1	430.0	1	430.0
4	5	25.0	2	280.0	7	305.0
5 1/	1	0.3	4	1,070.7	5	1,071.0
6	-	-	1	0.3 3/	-	0.3
7	1	1.0	-	-	1	1.0
8	1	9.0	1	579.4	2	588.4
9	6	9.0	2	327.5	8	336.5
10	3	21.0	5	1,385.4	8	1,406.4
LMR	20	70.3	20	4,467.3	40	4,537.6

1/ Includes plants put into operation soon after 1970.
2/ Includes plants using combination of groundwater and surface water.
3/ City of Rayville, Louisiana, power plant.

Table 17 - Summary of Present Use and Future Thermoelectric Power Production Cooling Water Withdrawal Requirements, Lower Mississippi Region

WRPA	1970 Withdrawal	1970 Consumption	Program	1980 Withdrawal	1980 Consumption	2000 Withdrawal	2000 Consumption	2020 Withdrawal	2020 Consumption
				Water Use, m.g.d.					
2	399.0	2.5	A	399.0	2.5	641.5	7.7	766.4	12.1
			B	399.0	2.5	718.5	8.6	889.1	14.0
3	430.0	6.0	A	549.9	8.9	1,565.6	18.7	1,981.6	31.3
			B	633.6	9.9	1,780.0	21.2	2,300.5	36.3
4	305.0	2.7	A	995.2	10.6	995.2	10.6	1,107.3	14.7
			B	995.2	10.6	1,045.4	12.5	1,257.9	19.8
5	1,071.0	9.8	A	1,071.0	9.8	2,905.2	34.6	3,441.6	54.3
			B	1,071.0	9.8	3,294.5	39.3	3,916.5	61.8
6	0.3	0.3	A	82.3	0.9	547.8	6.5	649.8	10.3
			B	97.1	1.0	575.1	6.9	713.5	11.3
7	1.0	0.6	A	55.9	0.5	397.6	5.2	473.2	7.5
			B	73.6	0.8	462.8	3.7	554.1	8.7
8	588.4	38.0	A	1,257.7	46.5	4,747.1	64.3	5,634.0	92.8
			B	1,396.1	48.0	5,316.8	72.0	6,394.7	105.3
9	336.5	22.0	A	651.1	26.3	2,520.1	30.6	3,180.1	58.4
			B	718.3	27.1	2,856.8	34.6	3,582.3	65.8
10	1,406.4	84.0	A	2,058.8	105.6	5,184.8	105.6	6,229.2	105.6
			B	2,242.0	107.5	5,781.1	107.5	7,070.1	118.0
MR	4,537.6	165.9	A	7,120.9	211.6	19,504.9	283.8	23,463.2	387.0
			B	7,625.9	217.2	21,831.0	306.3	26,678.7	440.0

Irrigation Water Supply

Present Status. In 1970, 2.4 million acres of cropland were being irrigated in the region. This amounted to about 15 percent of the 15.6 million acres harvested that year, but only about 6 percent of the region's Class I through IV agricultural lands on which irrigation could be used as a viable management option. Roughly 60 percent of the 4,828 m.g.d. withdrawn were used in the production of rice, the only crop grown in the region which required irrigation. Soybeans, cotton, corn, hay and vegetable crops, and a small amount of pasture collectively accounted for the other 40 percent. Irrigation was not essential to the production of these crops, but was applied in order to increase unit production. Water is currently used for irrigation in all planning areas, but the greatest volumes are withdrawn in WRPA's 2 and 9 - the region's major rice-producing areas. About 70 percent of the irrigation water came from ground water, with the remainder taken from surface sources, primarily streamflow. There was no widespread irrigation water shortage. However, water tables in some areas have declined to the extent that careful management of ground water is required to insure adequate future supplies from that source, particularly in WRPA 2 in the Grand Prairie region and to a lesser extent west of Crowley's Ridge. In portions of the coastal area along the Gulf there has been some saltwater encroachment in both ground water and surface water, but this has not caused any widespread discontinuation of irrigation practices.

Rice irrigation is essential to meeting food and fiber requirements. Crops other than rice are irrigated on a supplemental basis.

The watering of livestock and poultry, classified as other agricultural water use in Appendix H, required about 50 m.g.d. in 1970. Surface water, primarily on-farm stock ponds, provided about 60 percent of the water used for this purpose. The remainder was derived from ground water.

Water used for irrigation and watering of livestock and poultry in 1970 is shown by WRPA in table 18.

Table 18 - Irrigation, Livestock and Poultry Water Use in 1970, Lower Mississippi Region

		Water Use (m.g.d.)					
		Crops			Livestock and Poultry		
WRPA	Area Irrigated (Acres)	Ground Water	Surface Water	Total	Ground Water	Surface Water	Total
2	1,417,828	2,114.0	373.1	2,487.1	2.0	3.3	5.3
3	14,763	4.3	24.4	28.7	2.0	6.3	8.3
4	157,223	171.7	124.3	296.0	3.4	5.2	8.6
5	212,587	245.0	120.6	365.6	3.7	3.7	7.4
6	77,261	116.0	36.6	152.6	2.6	1.1	3.7
7	4,281	2.2	3.2	5.4	1.4	2.2	3.6
8	1,056	1.2	0.3	1.5	2.2	2.8	5.0
9	507,135	713.6	773.0	1,486.6	2.4	4.4	6.8
10	1,634	2.0	2.4	4.4	0.3	0.6	0.9
LMR	2,393,768	3,370.0	1,457.9	4,827.9	20.0	29.6	49.6

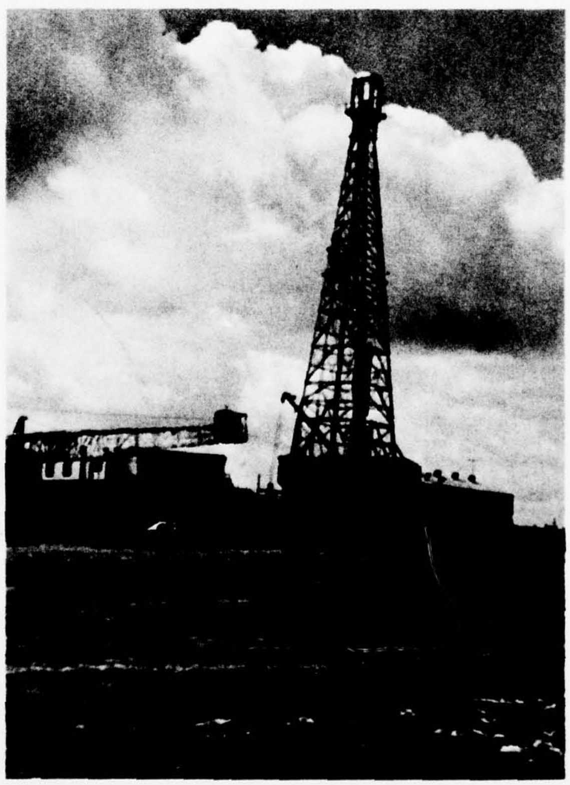
Future Needs. In order for the region to produce its share of the Nation's future food and fiber output, water must be available for growing those crops (rice and vegetables) which will not consistently produce satisfactory yields without irrigation. In 1970 nearly 1 million acres of the region's land were used for growing these crops, while 1.4 million additional acres were irrigated as a supplemental management practice. Acreages requiring irrigation are expected to show a slight decline to 1980 and a steady increase thereafter to 2020 for both Programs A and B, whereas acreages supplementally irrigated are expected to show a steady increase throughout the study period, resulting in an almost constant requirement for irrigation water to 1980 and a steady increase thereafter.

Livestock and poultry populations in the region will increase significantly over the next 50 years, with water use for this purpose more than doubling by 2020 for both programs.

Table 19 contains a summary of present use and future water needs for irrigation and livestock and poultry, along with corresponding irrigated acreages for Programs A and B for the 1980, 2000, and 2020 time frames. The expressed needs for supplemental irrigation should not be interpreted as absolute needs relative to food and fiber production requirements. However, they are considered indicative of future needs to minimize the risk of crop losses associated with year-to-year variation in moisture availability. They are further indicative of the potential for economic efficiency gains possible through supplemental irrigation.

Mineral Water Supply

Present Status. Water withdrawals are made by the minerals industry for petroleum drilling and secondary recovery operations (oil field flooding); mining sulfur by the Frasch process (liquifying sulfur for ease of removal); metallic mineral ore washing; and for production of



The use of brackish surface water for petroleum drilling constitutes one of the largest uses of water by the minerals industry.

Table 19 - Summary of Present Use and Future Irrigation and Other Agricultural Water Withdrawal Requirements, Lower Mississippi Region

Category	1970		Program	1980		2000		2020	
	Acres (1,000)	Water (m.g.d.)		Acres (1,000)	Water 1/ (m.g.d.)	Acres (1,000)	Water 1/ (m.g.d.)	Acres (1,000)	Water 1/ (m.g.d.)
Irrigation									
Essential	995	2,917	A	912	2,525	993	2,720	1,087	2,953
Supplemental	1,399	1,911	A	1,658	2,322	1,823	2,516	1,915	2,651
Subtotal	2,394	4,828	A	2,570	4,847	2,816	5,236	3,002	5,604
Essential			B	914	2,526	1,131	2,960	1,327	3,303
Supplemental			B	1,732	2,395	2,038	2,815	2,264	3,101
Subtotal			B	2,646	4,921	3,169	5,775	3,591	6,404
Livestock and Poultry		50	A		61		80		107
			B		61		86		115
TOTALS		4,878	A		4,880		5,318		5,714
			B		4,985		5,864		6,567

1/ Withdrawals may not agree exactly with Appendix H, due to conversion from acre-feet to m.g.d., rounding of numbers, and other minor adjustments required in water balance.

nonmetallic minerals, cement, and salt. Most petroleum and sulfur related use occurs in WRPA's 9 and 10, while other nonmetallic mineral production is distributed throughout the region. Metallic mineral production is concentrated in WRPA's 2 and 5. The estimated 1970 water withdrawn for mineral use was in excess of 600 m.g.d., mostly from brackish sources. Consumption was about 25 percent of the total water withdrawal. There were no shortages of water for this use in the region in 1970. Table 20 provides data on 1970 mineral water use.

Table 20 - Water Use for Mineral Production, 1970,
Lower Mississippi Region

	Water Withdrawals, m.g.d.				
	Ground Water		Surface Water		
WRPA	Fresh	Brackish	Fresh	Brackish	Total
2	4.0	-	-	-	4.0
3	0.7	-	-	-	0.7
4	0.3	-	0.8	-	1.1
5	45.5	-	9.5	-	55.0
6	6.3	-	0.8	-	7.1
7	3.2	-	0.5	-	3.7
8	-	12.0	15.8	-	27.8
9	-	-	18.0	254.0	272.0
10	-	-	48.0	182.9	230.9
LMR	60.0	12.0	93.4	436.9	602.3

Future Needs. Mineral production in the region is expected to double under Program A growth rates, or almost quadruple under Program B growth rates by the year 2020. The most rapid growth will be experienced in the metallic minerals sector of the industry. Future water needs for the minerals industry, shown in table 21, are expected to about triple under Program A growth rates or to be almost five times the 1970 use under Program B growth rates by 2020.

Table 21 - Summary of 1970 Use and Future Water Withdrawal Needs for Minerals, Lower Mississippi Region[1/]

WRPA	1970 Use Withdrawal	1970 Use Consumption	Program	1980 Withdrawal	1980 Consumption	2000 Withdrawal	2000 Consumption	2020 Withdrawal	2020 Consumption
2	4.0	0.6	A	5.0	0.7	5.2	0.7	5.3	0.8
			B	5.7	0.7	6.1	0.8	6.5	0.9
3	0.7	0.3	A	0.9	0.4	1.4	0.5	2.1	0.7
			B	1.0	0.4	1.6	0.6	2.3	0.8
4	1.1	0.5	A	1.1	0.5	1.3	0.6	1.6	0.7
			B	1.2	0.6	1.5	0.7	2.0	0.9
5	55.0	8.8	A	79.4	11.2	82.0	14.5	90.1	18.4
			B	91.4	12.9	116.7	18.6	144.1	25.6
6	7.1	2.0	A	7.6	2.4	11.7	3.5	16.0	4.6
			B	8.6	2.9	14.8	4.7	21.3	6.9
7	3.7	3.6	A	4.7	4.6	6.7	6.5	8.8	8.6
			B	5.1	5.0	7.9	7.7	10.9	10.6
8	27.8	7.5	A	39.9	11.3	74.2	22.0	112.7	34.9
			B	44.9	12.4	93.0	26.7	147.5	43.9
9	272.0	44.0	A	426.2	65.5	723.0	119.4	1,036.3	179.1
			B	433.7	71.6	753.8	135.6	1,097.1	211.3
10	230.9	85.1	A	302.2	122.7	440.9	204.6	598.5	305.0
			B	466.1	192.1	927.6	438.4	1,482.0	776.6
LMR	602.3	152.4	A	867.0	219.3	1,346.4	372.3	1,871.4	552.8
			B	1,057.7	298.6	1,918.0	633.8	2,913.7	1,077.5

1/ Withdrawals in m.g.d.

Fish and Wildlife Water Supply

Present Status. Water withdrawn in 1970 for fish and wildlife purposes amounted to over 3,300 m.g.d., with about 20 percent being from ground water and 80 percent from surface water. Consumption amounted to nearly 2,900 m.g.d. Withdrawals were used to maintain water levels in management areas for mast producing green tree reservoirs and duck resting areas, and to replenish lakes for sport fishing. Fish and wildlife use is the region's second largest consumptive use. Withdrawals were greatest in WRPA 10, which accounted for 56 percent of the total 1970 withdrawals. Other major withdrawals were made in planning areas 9, 2, and 5, with minor withdrawals in each of the remaining WRPA's. Table 22 provides pertinent WRPA data on 1970 withdrawals.

Table 22 - Fish and Wildlife Water Use, 1970, Lower Mississippi Region

	Water Withdrawals, (m.g.d.)		
WRPA	Surface	Ground	Total
2	145.0	435.0	580.0
3	8.2	24.8	33.0
4	15.5	15.5	31.0
5	241.3	12.7	254.0
6	63.6	3.4	67.0
7	2.5	2.5	5.0
8	2.0	1.0	3.0
9	363.0	121.0	484.0
10	1,843.0	2.0	1,845.0
LMR	2,684.1	617.9	3,302.0

Future Needs. Future water withdrawal needs for fish and wildlife are related to an increasing population of sportsmen dependent in part upon existing and future management areas. Because this population can vary in size without affecting the form or operation of management areas, future water withdrawal needs are considered to be identical for both the A and B Programs. Needs for fish and wildlife water

withdrawals are expected to increase from a current use of about 3,300 m.g.d. to about 4,500 m.g.d. by the year 2020, a 36 percent increase. Consumption based on present experience is estimated to be about 80 percent of withdrawals. Table 23 provides withdrawal and consumptive use data for future fish and wildlife water needs in the Lower Mississippi Region.

Water withdrawals are used to flood bottomland hardwoods such as the above to maintain "greentree reservoirs" for waterfowl management.

Commercial Fisheries Water Supply

Fishes harvested from the region's waters comprise three categories: (1) marine and estuarine fishes, (2) catfish and crayfish, and (3) wild fishes.

Marine and estuarine fishes are taken when of harvestable age. Included are the euryhaline species that can survive either in saltwater or freshwater and that characteristically enter inland fresh water areas for spawning purposes. Fishes and shellfishes in the catfish and crayfish category include only those raised in the agriculture industry. Wild fishes are those caught for commercial purposes in freshwater streams and lakes.

Table 23 - Summary of Present Use and Future Fish and Wildlife Water Withdrawal Needs, Lower Mississippi Region (m.g.d.)

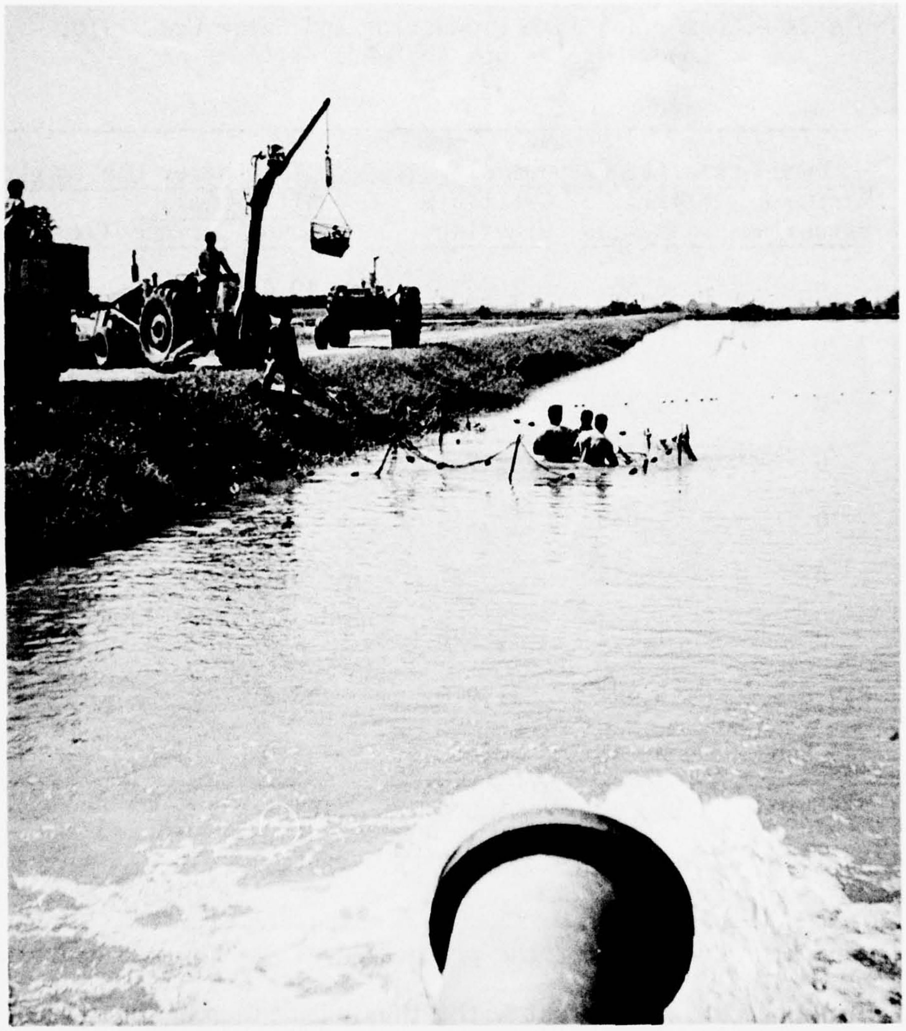
	1970			1980		2000		2020	
WRPA	Withdrawal	Consumption	Program	Withdrawal	Consumption	Withdrawal	Consumption	Withdrawal	Consumption
2	580	371	A & B	630	405	740	482	850	560
3	33	32	A & B	76	70	162	77	248	77
4	31	23	A & B	53	40	83	59	117	82
5	254	174	A & B	285	196	345	236	407	280
6	67	46	A & B	75	51	91	63	108	76
7	5	4	A & B	7	5	13	10	18	14
8	3	3	A & B	5	4	8	6	12	9
9	484	399	A & B	557	443	745	573	865	636
10	1,845	1,844	A & B	1,845	1,844	1,847	1,846	1,848	1,847
LMR	3,302	2,896		3,533	3,058	4,034	3,352	4,473	3,581

Commercial production of estuarine species such as oysters will decline in the future unless measures are undertaken such as reduction of estuarine pollution or addition of fresh water.

Present Status. The 1970 harvest of marine and estuarine fishes from the coastal fishery in WRPA's 9 and 10 was 1.2 billion pounds. There were no water withdrawals to aid the fishery. Water inflow to the estuaries generally came from tributary basin runoff, except in the case of diversions from the Mississippi River to the Atchafalaya River in WRPA 9.

The current production of the estuarine fishery is considered to be near maximum capability of the estuarine zone, considering multiple use of the coastal area.

Commercial harvest from the region's wild fishery produced about 25.3 million pounds of fish in 1970. The catch was rather evenly distributed between the planning areas. WRPA 9 was the leading producer with 5.5 million pounds, while WRPA 7 produced only 0.6 million pounds. A declining trend in the annual fishery harvest has leveled off in recent years. Most rivers and streams and some of the larger lakes contribute to this resource. No water withdrawals were required in 1970 to sustain the region's wild fishery.



Water being pumped into an artificial pond used for commercial production of catfish. Note harvesting operation.

Fish farming is a significant industry in the study area. Catfish farms are located throughout, with the greater 1970 concentrations in WRPA's 2, 9, and 4. Crayfish are raised mostly in the coastal area in WRPA's 9 and 10, generally as an off-season or rotational adjunct to rice production. In 1970 the fish farming industry's water withdrawals amounted to nearly 290 m.g.d., about 57 percent from ground water and the remainder from lakes and streams. Consumption was roughly 95 percent of withdrawals.

Total commercial fish production and water used in the production of catfish and crayfish in 1970 are provided in table 24.

Table 24 - Commercial Fish Production and Water Use, 1970, Lower Mississippi Region

WRPA	Production (1,000 pounds) Marine & Estuarine	Wild Fisheries	Catfish & Crayfish	1970 Water Use (m.g.d.)[1/] Withdrawals Ground	Surface	Consumption
2	0	6,037	10,435	40.0	59.9	94.9
3	0	1,398	391	3.7	0.0	3.5
4	0	2,301	7,369	56.5	14.1	67.1
5	0	3,487	2,748	15.7	6.7	21.3
6	0	1,059	1,213	6.1	2.6	8.3
7	0	612	587	4.5	1.1	5.3
8	0	1,102	896	1.0	0.9	1.8
9	869,673	5,492	11,978	33.8	33.0	63.5
10	353,846	3,741	2,383	3.0	4.5	7.1
LMR	1,223,519	25,229	38,000	164.3	122.8	272.8

TOTAL WITHDRAWALS - 287.1

1/ Withdrawals were made for the protection of catfish and crayfish only.

Future Needs. Consistent with study assumptions, the region's marine and estuarine fishery is considered to be producing at near maximum capability. However, this capability could be increased either by reducing estuarine pollution and/or adding fresh water which would also aid in salinity control. It is estimated that the amount of fresh water needed between 1980 and 2020 to supplement natural inflows for salinity control in the estuaries would be roughly 57,000 c.f.s. (about 36,900 m.g.d.). This much additional fresh water would enhance the estuarine productive capabilities sufficiently to offset losses that will occur from natural and man-made causes including future mineral extraction, and will allow a continued harvest of marine and estuarine fishes at the 1970 level beyond 1980.

Future harvests of wild fishes from the region have not been predicted inasmuch as no freshwater withdrawals are required for this

fishery. However, it will be necessary to maintain the quality and regimen of the region's rivers and streams to allow the continued harvesting of edible fishes.

There is foreseen a continued demand for all the catfish and crayfish the region's fish farming industry can produce. Future fish production requirements estimated for this study are given in table 25. A detailed discussion of the region's fisheries is contained in Appendix Q, Fish and Wildlife.

Future water supply needs for catfish and crayfish farming reflect feasible production increases. Therefore, water withdrawal needs will increase from the 1970 use of 290 m.g.d. to 1,030 m.g.d. by the year 2020. Table 26 provides a summary of the future water needs for commercial fisheries.

Summary of Water Supply Needs

Table 27 presents a regional summary of 1970 withdrawals, projected withdrawals, and consumption by water use category. Major use categories are industrial, irrigation, thermal, and fish and wildlife. These four uses accounted for over 90 percent of all water withdrawn from the region's surface and ground-water supply. By 2020 they are expected to account for 94 percent of all withdrawals, with industry using 5 out of every 9 gallons withdrawn. Withdrawals of cooling water for thermal power plants are expected to increase about fivefold. Consumption associated with these major uses is predicted to decline from the present 40 percent of combined withdrawals to only 20 percent in 2020. Rural domestic water use, reflecting decreasing rural population and greater dependence on centralized water distribution systems, will be the only use category to exhibit a decline in future decades. Figure 5 illustrates withdrawals and consumption graphically.

Table 28 gives a breakdown of regional withdrawals and consumption by WRPA.

In 1970 WRPA's 2, 9, and 10 led the region's planning areas in the amount of water used for various purposes, collectively withdrawing 2 out of every 3 gallons taken from the region's water supplies. Projections indicate that WRPA's 8, 9, and 10 in south Louisiana will account for increasingly larger shares of total water withdrawals. These three areas are projected to account for over three-fourths of the total regional water use in 2020 because of expected industrial expansion, with some industries requiring as much as a tenfold increase in water.

Tables 29 and 30 contain more detailed breakdowns of the region's water withdrawals, present and future, for the three study objectives.

Table 25 - Summary of Present and Future Fish Production Requirements, Lower Mississippi Region

	Existing Production, 1000 lbs.				Future Fish Production, 1000 lbs.[1/]					
					1980		2000		2020	
WRPA	Marine & Estuarine	Wild	Catfish & Crayfish	Program	Catfish & Crayfish	Total	Catfish & Crayfish	Total	Catfish & Crayfish	Total
2	0	6,037	10,435	A & B	13,513	19,550	19,669	25,706	25,826	31,863
3	0	1,398	391	A & B	691	2,089	1,291	2,689	1,891	3,289
4	0	2,301	7,369	A & B	12,913	15,214	24,000	26,301	35,087	37,388
5	0	3,487	2,748	A & B	4,878	8,365	8,739	12,226	13,000	16,487
6	0	1,059	1,213	A & B	3,070	4,129	6,583	7,642	10,196	11,255
7	0	612	587	A & B	978	1,590	1,761	2,373	2,543	3,155
8	0	1,102	896	A & B	1,356	2,458	1,878	2,980	2,200	3,302
9	869,673	5,492	11,978	A & B	17,161	892,326	22,726	897,891	29,891	905,056
10	353,846	3,741	2,383	A & B	2,883	360,470	3,683	361,270	4,483	362,070
LMR	1,223,519	25,229	38,000	A & B	57,443	1,306,191	90,330	1,339,078	125,117	1,373,865

1/ Marine and Estuarine production constant at 1,223,519 lbs./yr.
Wild fisheries production constant at 25,229 lbs./yr.

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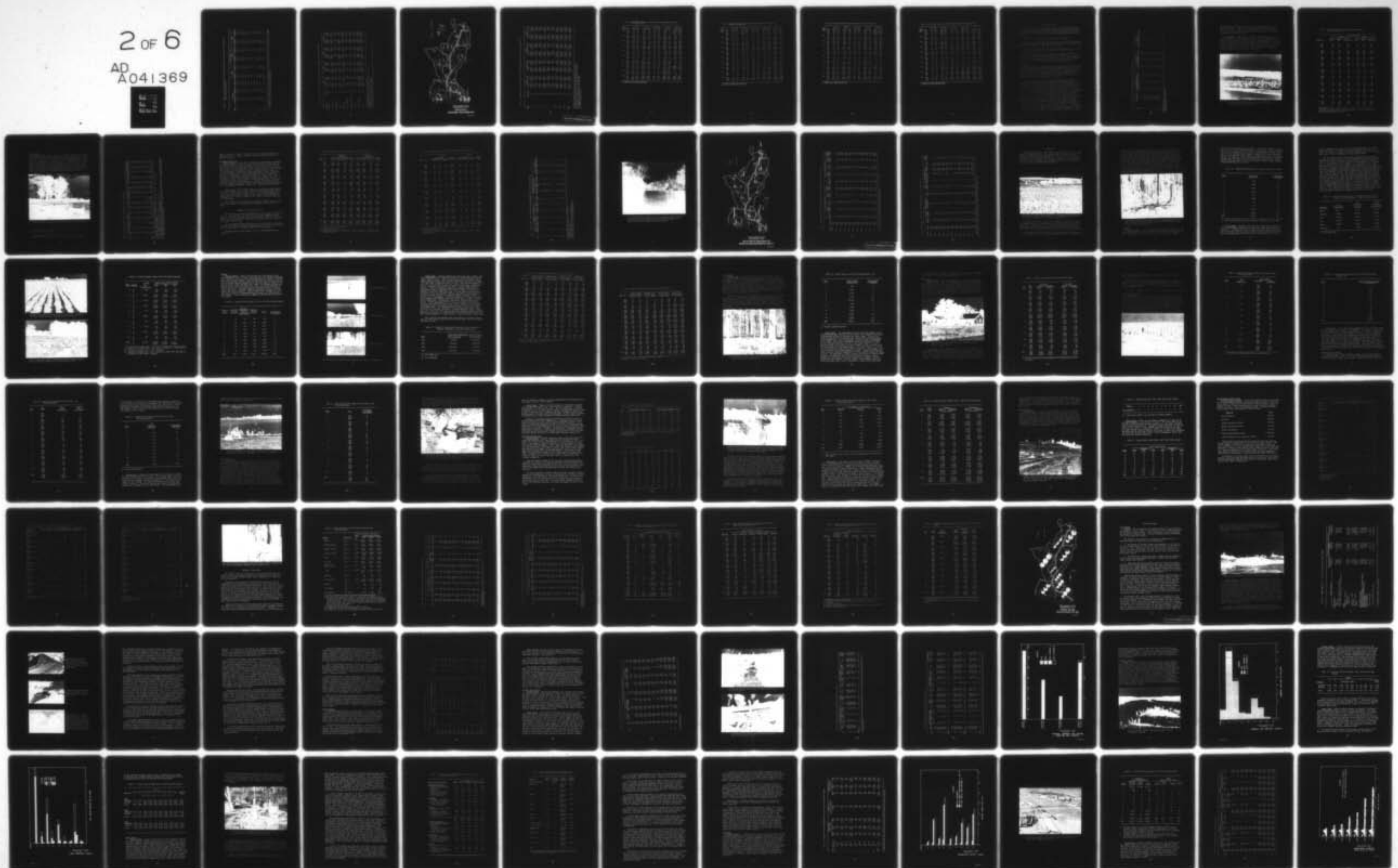


Table 26 - Summary of 1970 Use and Future Water Supply Withdrawal Needs for Commercial Fish Production, Lower Mississippi Region1/

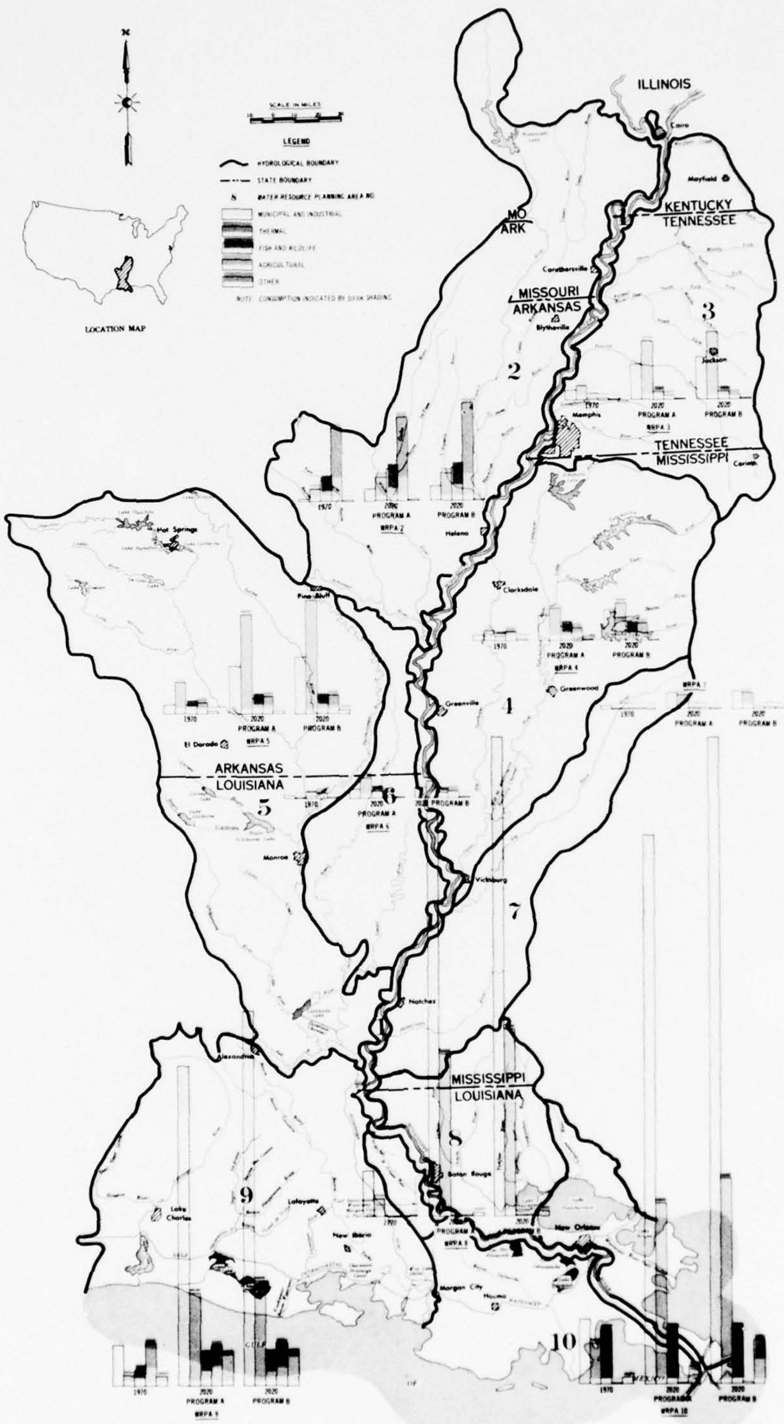
	1970 Use			Water Needs, m.g.d.					
				1980		2000		2020	
WRPA	Withdrawal	Consumption	Program	Withdrawal	Consumption	Withdrawal	Consumption	Withdrawal	Consumption
2	99.9	94.9	A & B	130.0	117.0	188.0	169.2	247.0	222.3
3	3.7	3.5	A & B	6.6	6.0	12.4	11.1	18.1	16.2
4	70.6	67.1	A & B	123.6	111.2	229.8	206.8	336.0	302.4
5	22.4	21.3	A & B	40.8	36.7	77.8	70.0	118.6	106.7
6	8.7	8.3	A & B	24.6	22.1	56.3	50.7	88.1	79.3
7	5.6	5.3	A & B	9.4	8.5	16.9	15.2	24.4	22.0
8	1.9	1.8	A & B	4.4	4.0	9.4	8.5	14.4	13.0
9	66.8	63.5	A & B	85.8	77.2	123.8	111.4	161.7	145.5
10	7.5	7.1	A & B	10.4	9.4	16.1	14.5	21.9	19.7
LMR	287.1	272.8	A & B	435.6	392.1	730.5	657.4	1,030.2	927.1

1/ Need for water supply to Marine and Estuarine fisheries 36,900 m.g.d. held constant over time WRPA 10 = 28,000 and WRPA 9 = 8,900 (not included in above tabulation).

Table 27 - Summary of Present and Projected Water Withdrawals by Category, Lower Mississippi Region

Use[1]	Objective[2]	1970 W[3]	1970 C[4]	1980 W[3]	1980 C[4]	2000 W[3]	2000 C[4]	2020 W[3]	2020 C[4]
Municipal	A	616.7	229.0	756.2	278.0	1,092.7	406.4	1,549.8	577.9
	B	616.7	229.0	818.4	301.1	1,231.0	457.9	1,771.3	660.8
Industrial	A	5,419.8	846.0	8,208.3	1,308.2	19,990.5	3,299.2	47,178.3	7,843.2
	B	5,419.8	846.0	9,008.2	1,437.6	23,112.6	3,821.0	55,648.5	9,257.4
Rural Domestic	A	121.9	121.9	109.1	109.1	91.5	91.5	71.9	71.9
	B	121.9	121.9	118.1	118.1	103.1	103.1	81.8	81.8
Thermal	A	4,537.6	165.9	7,120.9	211.6	19,504.9	283.8	23,463.2	387.0
	B	4,537.6	165.9	7,625.9	217.2	21,831.0	306.3	26,678.7	441.0
Irrigation	A	4,827.9	3,460.2	4,847.1	3,490.7	5,236.2	3,797.1	5,603.7	4,062.8
	B	4,827.9	3,460.2	4,921.1	3,568.3	5,775.5	4,191.2	6,403.9	4,650.9
Other Agriculture	A	49.6	49.6	60.7	60.7	80.5	80.5	106.3	106.3
	B	49.6	49.6	60.7	60.7	85.7	85.7	113.2	113.2
Commercial Fishing[5]	A	287.1	272.8	435.6	392.1	730.5	657.4	1,031.2	927.1
	B	287.1	272.8	435.6	392.1	730.5	657.4	1,031.2	927.1
Minerals	A	602.3	152.4	867.0	219.5	1,346.4	372.3	1,871.4	552.8
	B	602.3	152.4	1,057.7	298.6	1,918.0	633.8	2,913.7	1,077.5
Fish and Wildlife	A	3,302.0	2,896.0	3,533.0	3,058.0	4,034.0	3,352.0	4,473.0	3,581.0
	B	3,302.0	2,896.0	3,533.0	3,058.0	4,034.0	3,352.0	4,473.0	3,581.0
LMR	A	19,764.9	8,193.8	25,937.9	9,127.7	52,107.2	12,340.2	85,348.8	18,110.0
	B	19,764.9	8,193.8	27,578.1	9,451.7	58,821.4	13,608.4	99,115.3	20,790.7

1/ Includes brackish water in some categories.
2/ National Income Objective, A; Regional Development Objective, B.
3/ Withdrawals in million gallons per day (mgd).
4/ Consumption in million gallons per day (mgd).
5/ Does not include 36,900 m.g.d. of Mississippi River diversion required for estuarine salinity control.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

WATER SUPPLY
WITHDRAWALS AND CONSUMPTION

FIGURE 5

Table 28 - Summary of Present and Projected Water Withdrawals by WRPA, Lower Mississippi Region 1/

WRPA	Objective 2/	1970		1980		2000		2020	
		W3/	C4/	W3/	C4/	W3/	C4/	W3/	C4/
2	A	3,672.5	2,391.9	3,841.1	2,482.2	4,540.3	2,818.5	5,192.6	3,146.1
	B	3,672.5	2,391.9	3,905.4	2,549.4	4,935.2	3,047.1	5,844.5	3,518.5
3	A	767.0	161.6	1,061.2	256.6	2,485.2	355.4	3,592.9	503.7
	B	767.0	161.6	1,179.5	268.6	2,794.0	386.6	4,134.9	565.4
4	A	874.2	369.9	1,780.3	505.1	2,146.5	655.8	2,866.7	834.3
	B	874.2	369.9	1,808.8	515.5	2,324.6	715.0	3,265.9	929.9
5	A	2,052.3	609.7	2,303.3	740.2	4,708.3	1,026.0	6,267.3	1,449.6
	B	2,052.3	609.7	2,365.5	760.4	5,321.1	1,122.4	7,187.7	1,627.0
6	A	315.6	190.9	469.0	239.9	1,067.6	307.6	1,373.6	390.2
	B	315.6	190.9	499.5	246.6	1,139.5	327.1	1,520.5	423.7
7	A	115.1	37.4	222.7	56.9	717.0	92.7	1,093.0	143.8
	B	115.1	37.4	253.2	59.7	820.0	99.3	1,255.4	158.2
8 5/	A	2,201.5	465.5	3,664.6	742.1	10,643.5	1,938.4	19,804.4	4,726.3
	B	2,201.5	465.5	4,033.3	807.9	12,130.3	2,237.6	23,111.8	5,568.7
9 5/	A	4,042.4	1,757.4	5,067.6	1,774.6	10,276.6	2,487.6	17,590.6	3,661.4
	B	4,042.4	1,757.4	5,349.7	1,818.4	11,505.3	2,704.3	20,125.0	4,085.2
10 5/	A	5,722.1	2,206.5	7,523.0	2,331.8	15,522.6	2,658.0	27,567.9	3,254.4
	B	5,722.1	2,206.5	8,183.2	2,425.1	17,856.8	2,968.7	32,669.8	3,913.6
LMR	A	19,767.2	8,190.8	25,932.8	9,129.4	52,107.6	12,340.0	85,349.0	18,109.8
	B	19,767.2	8,190.8	27,578.1	9,451.6	58,826.8	13,608.1	99,115.5	20,790.2

1/ Does not include water needed for estuarine salinity control.
2/ National Income Objective, A; Regional Development Objective, B.
3/ Withdrawals in million gallons per day (mgd).
4/ Consumption in million gallons per day (mgd).
5/ Includes brackish water.

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Table 29 - Water Withdrawals & Consumption, National Income Objective and Environmental Quality Objective, Lower Mississippi Region

Planning Area	Year	Municipal W1/	Municipal C2/	Industrial W1/	Industrial C2/	Rural Domestic W1/	Rural Domestic C2/	Thermal W1/	Thermal C2/	Irrigation W1/	Irrigation C2/
WRPA 2	1970	34.8	12.9	38.8	15.5	24.7	24.7	399.0	2.5	2,486.0	1,864.5
	1980	40.1	14.7	58.3	23.5	20.6	20.6	399.0	2.5	2,552.0	1,891.5
	2000	56.6	21.2	142.8	57.2	16.0	16.0	641.5	7.7	2,741.1	2,055.8
	2020	82.6	30.9	332.0	132.9	10.6	10.6	766.4	12.1	2,887.5	2,165.6
WRPA 3	1970	141.8	52.7	98.1	14.6	22.7	22.7	430.0	6.0	28.7	21.5
	1980	175.7	64.6	149.5	22.2	20.0	20.0	549.9	8.9	72.6	54.5
	2000	278.1	103.3	351.2	52.0	14.3	14.3	1,565.6	18.7	86.9	65.2
	2020	408.8	152.3	800.6	118.5	11.9	11.9	1,981.6	31.3	104.1	78.1
WRPA 4	1970	53.8	20.0	86.6	7.1	21.7	21.7	305.0	2.7	296.0	219.2
	1980	65.7	24.2	135.5	9.9	18.9	18.9	995.2	10.6	376.6	279.1
	2000	89.8	33.4	320.4	21.6	14.7	14.7	995.2	10.6	398.3	295.1
	2020	123.7	46.1	729.3	46.6	11.1	11.1	1,107.3	14.7	421.2	312.1
WRPA 5	1970	54.3	20.2	206.7	68.2	16.1	16.1	1,071.0	9.8	365.6	283.9
	1980	65.9	24.2	307.4	101.0	14.4	14.4	1,071.0	9.8	434.8	337.8
	2000	89.8	33.4	683.9	224.5	12.2	12.2	2,905.2	34.6	500.2	388.6
	2020	133.8	49.9	1,497.8	486.0	5.5	5.5	3,441.6	54.3	556.6	432.5
WRPA 6	1970	8.1	3.0	61.5	6.5	6.7	6.7	0.3	0.3	152.0	114.4
	1980	9.1	3.4	71.3	8.3	5.2	5.2	82.3	0.9	189.3	142.0
	2000	11.4	4.2	135.9	17.1	3.9	3.9	547.8	6.5	203.5	152.6
	2020	14.7	5.5	261.3	35.0	2.7	2.7	649.8	10.3	224.8	168.6
WRPA 7	1970	12.0	4.5	73.6	6.0	5.2	5.2	1.0	0.6	5.4	4.6
	1980	15.3	5.6	105.5	10.1	4.6	4.6	55.9	0.6	15.8	13.4
	2000	22.1	8.2	235.0	24.3	3.4	3.4	397.6	5.2	16.3	13.9
	2020	32.8	12.2	509.1	55.3	1.9	1.9	473.2	7.5	16.8	14.3
WRPA 8	1970	55.2	20.5	1,514.2	386.7	4.5	4.5	588.4	35.3	1.5	1.3
	1980	72.1	26.5	2,261.3	627.6	4.9	4.9	1,257.7	46.5	13.5	11.5
	2000	108.6	40.4	5,668.5	1,771.6	6.1	6.1	4,747.1	64.3	13.9	11.8
	2020	157.5	58.8	13,840.9	4,487.1	8.4	8.4	5,634.0	92.8	14.4	12.2
WRPA 9	1970	72.0	26.7	1,301.5	230.7	16.8	16.8	336.5	21.9	1,486.6	948.0
	1980	92.0	33.7	2,047.4	347.9	15.1	15.1	651.1	26.3	1,184.8	756.0
	2000	126.2	47.0	4,745.0	771.7	14.7	14.7	2,520.1	30.6	1,267.8	808.9
	2020	167.7	62.5	10,780.8	1,676.7	14.7	14.7	3,180.1	58.4	1,369.7	873.9
WRPA 10	1970	184.7	68.5	2,038.8	110.7	3.5	3.5	1,406.4	84.0	4.4	2.8
	1980	220.3	81.1	3,072.1	157.7	5.4	5.4	2,058.8	105.6	7.7	4.9
	2000	310.1	115.3	7,707.8	359.2	6.2	6.2	5,184.8	105.6	8.2	5.2
	2020	428.2	159.7	18,426.5	805.1	5.1	5.1	6,229.2	105.6	8.6	5.5
REGION	1970	616.7	229.0	5,419.8	846.0	121.9	121.9	4,537.6	163.1	4,827.9	3,460.2
	1980	756.2	278.0	8,208.3	1,308.2	109.1	109.1	7,120.9	211.7	4,847.1	3,490.7
	2000	1,092.7	406.4	19,990.5	3,299.2	91.5	91.5	19,504.9	283.8	5,236.2	3,797.1
	2020	1,549.8	577.9	47,178.3	7,843.2	71.9	71.9	23,463.2	387.0	5,603.7	4,062.8

1/ Withdrawals in million gallons per day (m.g.d.)
2/ Consumption in million gallons per day (m.g.d.)

Table 29 - Water Withdrawals & Consumption, National Income Objective and Environmental Quality Objective, Lower Mississippi Region (Cont'd)

Planning Area	Year	Other Agri.		Com. Fishing		Minerals		Fish & Wildlife		Totals	
		w1/	c2/	w1/	c2/	w1/	c2/	w1/	c2/	w1/	c2/
WRPA 2	1970	5.3	5.3	99.9	94.9	4.0	0.6	580.0	371.0	3,672.5	2,391.9
	1980	6.7	6.7	129.4	117.0	5.0	0.7	630.0	405.0	3,841.1	2,482.2
	2000	8.7	8.7	188.	169.2	5.2	0.7	740.0	482.0	4,540.3	2,818.5
	2020	10.9	10.9	247.	222.3	5.3	0.8	850.0	560.0	5,192.6	3,146.1
WRPA 3	1970	8.3	8.3	3.7	3.5	0.7	0.3	33.0	32.0	767.0	161.6
	1980	10.0	10.0	6.6	6.0	0.9	0.4	76.0	70.0	1,061.2	256.6
	2000	13.3	13.3	12.4	11.1	1.4	0.5	162.0	77.0	2,485.2	355.4
	2020	17.7	17.7	18.1	16.2	2.1	0.7	248.0	77.0	3,592.9	503.7
WRPA 4	1970	8.6	8.6	70.6	67.1	1.1	0.5	31.0	23.0	874.2	369.9
	1980	10.7	10.7	123.6	111.2	1.1	0.5	53.0	40.0	1,780.3	505.1
	2000	14.0	14.0	229.8	206.8	1.3	0.6	83.0	59.0	2,146.5	655.8
	2020	18.6	18.6	336.9	302.4	1.6	0.7	117.0	82.0	2,866.7	834.3
WRPA 5	1970	7.4	7.4	22.4	21.3	55.0	8.8	254.0	174.0	2,052.3	609.7
	1980	9.1	9.1	40.8	36.7	74.9	11.2	285.0	196.0	2,303.3	740.2
	2000	12.2	12.2	77.8	70.0	82.0	14.5	345.0	236.0	4,708.3	1,026.0
	2020	16.3	16.3	118.6	106.7	90.1	18.4	407.0	280.0	6,267.3	1,449.6
WRPA 6	1970	3.7	3.7	8.7	8.3	7.1	2.0	67.0	46.0	315.6	190.9
	1980	4.6	4.6	24.6	22.1	7.6	2.4	75.0	51.0	469.0	239.9
	2000	6.1	6.1	56.3	50.7	11.7	3.5	91.0	63.0	1,067.6	307.6
	2020	8.2	8.2	88.1	79.3	16.0	4.6	108.0	76.0	1,373.6	390.2
WRPA 7	1970	3.6	3.6	5.6	5.3	3.7	3.6	5.0	4.0	115.1	37.4
	1980	4.5	4.5	9.4	8.5	4.7	4.6	7.0	5.0	222.7	56.9
	2000	6.0	6.0	16.9	15.2	6.7	6.5	13.0	10.0	717.0	92.7
	2020	8.0	8.0	24.4	22.0	8.8	8.6	18.0	14.0	1,093.0	143.8
WRPA 8	1970	5.0	5.0	1.9	1.8	27.8	7.4	3.0	3.0	2,201.5	465.5
	1980	5.8	5.8	4.4	4.0	39.9	11.3	5.0	4.0	3,664.6	742.1
	2000	7.7	7.7	9.4	8.5	74.2	22.0	8.0	6.0	10,643.5	1,938.4
	2020	10.1	10.1	14.4	13.0	112.7	34.9	12.0	9.0	19,804.4	4,726.3
WRPA 9	1970	6.8	6.8	66.8	63.5	272.0	44.0	484.0	399.0	4,042.4	1,757.4
	1980	8.2	8.2	85.8	77.2	426.2	67.2	557.0	443.0	5,067.6	1,774.6
	2000	11.0	11.0	123.8	111.4	723.0	119.3	745.0	573.0	10,276.6	2,487.6
	2020	14.6	14.6	161.7	145.5	1,036.3	179.1	865.0	636.0	17,590.6	3,661.4
WRPA 10	1970	0.9	0.9	7.5	7.1	230.9	85.0	1,845.0	1,844.0	5,722.1	2,206.5
	1980	1.1	1.1	10.4	9.4	302.2	122.6	1,845.0	1,844.0	7,523.0	2,331.8
	2000	1.5	1.5	16.1	14.5	440.9	204.5	1,847.0	1,846.0	15,522.6	2,658.0
	2020	1.9	1.9	21.9	19.7	598.5	304.8	1,848.0	1,847.0	27,567.9	3,254.4
Region	1970	49.6	49.6	287.1	272.8	602.3	152.2	3,302.0	2,896.0	19,767.2	8,190.8
	1980	60.7	60.7	435.0	392.1	862.5	220.9	3,533.0	3,058.0	25,932.8	9,129.4
	2000	80.5	80.5	730.9	657.4	1,346.4	372.1	4,034.0	3,352.0	52,107.6	12,340.0
	2020	106.3	106.3	1,031.4	927.1	1,871.4	552.6	4,473.0	3,581.0	85,349.0	18,109.8

1/ Withdrawals in million gallons per day (m.g.d.)
2/ Consumption in million gallons per day (m.g.d.)

Table 30 - Water Withdrawals & Consumption, Regional Development Objective, Lower Mississippi Region

Planning Area	Year	Municipal w1/	Municipal c2/	Industrial w1/	Industrial c2/	Rural Domestic w1/	Rural Domestic c2/	Thermal w1/	Thermal c2/	Irrigation w1/	Irrigation c2/
WRPA 2	1970	34.8	12.9	38.8	15.5	24.7	24.7	399.0	2.5	2,487.1	1,864.5
	1980	43.1	15.8	64.0	25.6	22.3	22.3	399.0	2.5	2,605.0	1,953.8
	2000	63.4	23.6	164.8	65.8	17.7	17.7	718.5	8.6	3,027.6	2,270.7
	2020	96.1	35.9	391.2	156.4	12.2	12.2	889.	14.0	3,341.2	2,505.9
WRPA 3	1970	141.8	52.7	98.	14.6			430.0	6.0	28.7	21.5
	1980	192.9	71.0	163.8	24.1	22.0	22.0	633.6	9.9	73.6	55.2
	2000	316.0	117.5	398.1	58.6	16.2	16.2	1,780.0	21.2	93.4	70.1
	2020	474.5	176.8	944.	139.6	13.9	13.9	2,300.5	36.3	114.4	85.8
WRPA 4	1970	53.8	20.0	86.6	7.1	21.7	21.7	305.0	2.7	296.0	219.2
	1980	71.9	26.4	148.6	10.9	20.6	20.6	995.2	10.6	384.0	284.5
	2000	101.8	37.8	370.6	25.1	16.7	16.7	1,045.4	12.5	460.8	341.4
	2020	140.4	52.4	859.7	54.9	12.6	12.6	1,257.9	19.8	519.4	384.9
WRPA 5	1970	54.3	20.2	206.7	68.2	16.1	16.1	1,071.0	9.8	365.6	283.9
	1980	70.0	25.8	345.9	115.3	15.3	15.3	1,071.0	9.8	437.0	339.5
	2000	101.9	37.9	808.5	266.5	13.9	13.9	3,294.5	39.3	549.7	427.1
	2020	152.2	56.8	1,803.5	589.0	6.3	6.3	3,916.5	61.8	622.0	483.3
WRPA 6	1970	8.1	3.0	61.5	6.5	6.7	6.7	0.3	0.3	152.6	114.4
	1980	9.8	3.6	78.9	9.3	5.6	5.6	97.1	1.0	195.3	146.5
	2000	11.9	4.4	157.2	19.8	4.0	4.0	575.1	6.9	222.6	167.0
	2020	16.2	6.1	306.8	41.2	2.9	2.9	713.5	11.3	254.9	191.2
WRPA 7	1970	12.0	4.5	73.6	6.0	5.2	5.2	1.0	0.6	5.4	4.6
	1980	17.0	6.2	114.9	10.5	5.1	5.1	73.6	0.8	16.6	14.1
	2000	25.7	9.5	263.0	25.5	4.0	4.0	462.8	3.7	20.3	17.3
	2020	38.3	14.3	575.1	57.6	2.2	2.2	554.1	8.7	23.9	20.3
WRPA 8	1970	55.2	20.5	1,514.2	386.7	4.5	4.5	588.4	35.3	1.5	1.3
	1980	77.7	28.6	2,480.2	687.8	5.3	5.3	1,396.1	48.0	14.1	12.0
	2000	121.5	45.2	6,548.8	2,049.1	6.9	6.9	5,316.8	72.0	17.7	15.0
	2020	178.8	66.7	16,322.3	5,292.0	9.5	9.5	6,394.7	105.3	21.8	18.5
WRPA 9	1970	72.0	26.7	1,301.5	230.7	16.8	16.8	336.5	21.9	1,486.6	948.0
	1980	98.2	36.2	2,244.8	381.3	16.1	16.1	718.3	27.1	1,187.6	757.7
	2000	142.9	53.3	5,486.6	895.3	16.7	16.7	2,856.8	34.6	1,367.9	872.7
	2020	188.9	70.6	12,714.3	1,977.5	16.5	16.5	3,582.3	65.8	1,483.6	946.5
WRPA 10	1970	184.7	68.5	2,038.8	110.7	3.5	3.5	1,406.4	84.0	4.4	2.8
	1980	237.8	87.5	3,367.1	172.8	5.8	5.8	2,242.0	107.5	7.9	5.0
	2000	345.9	128.7	8.915.0	415.3	7.0	7.0	5,781.1	107.5	15.5	9.9
	2020	485.9	181.2	21,731.4	949.2	5.7	5.7	7,070.1	118.0	22.7	14.5
REGION	1970	616.7	229.0	5,419.8	846.0	121.9	121.9	4,537.6	163.1	4,827.9	3,460.2
	1980	818.4	301.1	9,008.2	1,437.6	118.1	118.1	7,625.9	217.2	4,921.1	3,568.3
	2000	1,231.0	457.9	23,112.6	3,821.0	103.1	103.1	21,831.0	306.3	5,775.5	4,191.2
	2020	1,771.3	660.8	55,648.5	9,257.4	81.8	81.8	26,678.7	441.0	6,403.9	4,650.9

1/ Withdrawals in million gallons per day (m.g.d.)
2/ Consumption in million gallons per day (m.g.d.)

Table 30 - Water Withdrawals & Consumption, Regional Development Objective, Lower Mississippi Region (Cont'd)

Planning Area	Year	Other Agri. W1/	Other Agri. C2/	Com. Fishing W1/	Com. Fishing C2/	Minerals W1/	Minerals C2/	Fish & Wildlife W1/	Fish & Wildlife C2/	Totals W1/	Totals C2/
WRPA 2	1970	5.3	5.3	99.9	94.9	4.0	0.6	580.0	371.0	3,672.5	2,391.9
	1980	6.7	6.7	129.4	117.0	5.7	0.7	630.0	405.0	3,905.4	2,549.4
	2000	8.7	8.7	188.4	169.2	6.1	0.8	740.0	482.0	4,935.2	3,047.1
	2020	10.9	10.9	247.3	222.3	6.5	0.9	850.0	560.0	5,844.5	3,518.5
WRPA 3	1970	8.3	8.3	3.7	3.5	0.7	0.3	33.0	32.0	767.0	161.6
	1980	10.0	10.0	6.6	6.0	1.0	0.4	76.0	70.0	1,179.5	268.6
	2000	14.3	14.3	12.4	11.1	1.6	0.6	162.0	77.0	2,794.0	386.6
	2020	19.0	19.0	18.1	16.2	2.3	0.8	248.0	77.0	4,134.9	565.4
WRPA 4	1970	8.6	8.6	70.6	67.1	1.1	0.5	31.0	23.0	874.2	369.9
	1980	10.7	10.7	123.6	111.2	1.2	0.6	53.0	40.0	1,808.8	515.5
	2000	15.0	15.0	229.8	206.8	1.5	0.7	83.0	59.0	2,324.6	715.0
	2020	20.0	20.0	336.9	302.4	2.0	0.9	117.0	82.0	3,265.9	929.9
WRPA 5	1970	7.4	7.4	22.4	21.3	55.0	8.8	254.0	174.0	2,052.3	609.7
	1980	9.1	9.1	40.8	36.7	91.4	12.9	285.0	196.0	2,365.5	760.4
	2000	13.1	13.1	77.8	70.0	116.7	18.6	345.0	236.0	5,321.1	1,122.4
	2020	17.5	17.5	118.6	106.7	144.1	25.6	407.0	280.0	7,187.7	1,627.0
WRPA 6	1970	3.7	3.7	8.7	8.3	7.1	2.0	67.0	46.0	315.6	190.9
	1980	4.6	4.6	24.6	22.1	8.6	2.9	75.0	51.0	499.5	246.6
	2000	6.6	6.6	56.3	50.7	14.8	4.7	91.0	63.0	1,139.5	327.1
	2020	8.8	8.8	88.1	79.3	21.3	6.9	108.0	76.0	1,520.5	423.7
WRPA 7	1970	3.6	3.6	5.6	5.3	3.7	3.6	5.0	4.0	115.1	37.4
	1980	4.5	4.5	9.4	8.5	5.1	5.0	7.0	5.0	253.2	59.7
	2000	6.4	6.4	16.9	15.2	7.9	7.7	13.0	10.0	820.0	99.3
	2020	8.5	8.5	24.4	22.0	10.9	10.6	18.0	14.0	1,255.4	158.2
WRPA 8	1970	5.0	5.0	1.9	1.8	27.8	7.4	3.0	3.0	2,201.5	465.5
	1980	5.8	5.8	4.4	4.0	44.9	12.4	5.0	4.0	4,033.3	807.9
	2000	8.2	8.2	9.4	8.5	93.0	26.7	8.0	6.0	12,130.3	2,237.6
	2020	10.8	10.8	14.4	13.0	147.5	43.9	12.0	9.0	23,111.8	5,568.7
WRPA 9	1970	6.8	6.8	66.8	63.5	272.0	44.0	484.0	399.0	4,042.4	1,757.4
	1980	8.2	8.2	85.8	77.2	433.7	71.6	557.0	443.0	5,349.7	1,818.4
	2000	11.8	11.8	123.8	111.4	753.8	135.5	745.0	573.0	11,505.3	2,704.3
	2020	15.6	15.6	161.7	145.5	1,097.1	211.2	865.0	636.0	20,125.0	4,085.2
WRPA 10	1970	0.9	0.9	7.5	7.1	230.9	85.0	1,845.0	1,844.0	5,722.1	2,206.5
	1980	1.1	1.1	10.4	9.4	466.1	192.0	1,845.0	1,844.0	8,183.2	2,425.1
	2000	1.6	1.6	16.1	14.5	927.6	438.2	1,847.0	1,846.0	17,856.8	2,968.7
	2020	2.1	2.1	21.9	19.7	1,482.0	776.2	1,848.0	1,847.0	32,669.8	3,913.6
Region	1970	49.6	49.6	287.1	272.8	602.3	152.2	3,302.0	2,896.0	19,762.7	8,190.8
	1980	60.7	60.7	435.0	392.1	1,057.7	298.5	3,533.0	3,058.0	27,578.1	9,451.6
	2000	85.7	85.7	730.9	657.4	1,923.0	633.5	4,034.0	3,352.0	58,826.8	13,608.1
	2020	113.2	113.2	1,031.4	927.1	2,913.7	1,077.0	4,473.0	3,581.0	99,115.5	20,790.2

1/ Withdrawals in million gallons per day (m.g.d.)
2/ Consumption in million gallons per day (m.g.d.)

Water Surface Area

Water areas in the Lower Mississippi Region provide opportunities for swimming, boating, water skiing, and many other recreational activities. They also provide fish and wildlife habitat, and their scenic qualities and other attributes enhance the environmental quality of the study area.

Water surface area needs are categorized as follows:

LARGE WATER - Large lakes with more than 500 acres of surface area, small lakes between 40 and 500 acres in size, and all rivers and streams averaging one-eighth of a mile and more in width.

SMALL WATER - Small lakes and ponds less than 40 acres in size and all streams averaging less than one-eighth of a mile in width.

STREAMS - Reaches of certain rivers and streams with unique or special attributes which make them worthy of maintenance in a specified state as an inheritance for future generations. The basic measurement unit is miles, but conversion to acres is made in some instances to allow comparison with other water areas in compatible units.

Recreation

Present Status. Long summers and mild winters help to make outdoor recreation activities a popular pastime on and around lakes in the region. Such water bodies cover 2.2 million acres of the region's area. Nearly 800,000 acres of large lakes are located in coastal areas (WRPA's 8, 9, and 10). Small lakes are dispersed regionwide. Most of this large water is suitable for intensive recreational activity, as evidenced by nearly 68 million user days in 1970.

Table 31 gives a resume of water-dependent recreation in 1970, allowing comparison of resource needs and resource availability. Although 1970 use figures were unavailable in terms of acreages, region and WRPA acreage needs were estimated based on space standards and national participation rates in activities such as water skiing, boating, canoeing, and sailing, which require water bodies of 40 acres or more in size. For purposes of recreation a distinction is made between lakes 40 to 500 acres in size and lakes over 500 acres, collectively large water. Some needs for swimming were also satisfied by these large water areas. The table clearly shows that WRPA 3 had less water surface than was needed in 1970. Assuming the estimated needs are a close approximation of 1970 use, the WRPA 3 residents, primarily Memphians, spent a considerable amount of time and money on travel to large lakes in other WRPA's. It appears likely that some of that travel was to WRPA 5, a distance of at least 200 miles. In terms of the 1970 net needs for lakes between 40 and 500 acres in size, WRPA's 3, 4, 5, and 8 had significantly less small water than required. Recreationists seeking small lake experiences in WRPA 8 probably satisfied

Table 31 - Need and Resource Availability, Water Dependent Recreation, 1970, Lower Mississippi Region

WRPA	Recreation Days	Gross Need Surface Area (1,000 acres)			Available Resource[1] (1,000 acres)			Net Need (1,000 Acres)		
		Large Lakes[2]	Small Lakes[3]	Total Lakes	Large Lakes[2]	Small Lakes[3]	Total Lakes	Large Lakes[2]	Small Lakes[3]	Total Lakes
1	0	0	0	0	368	0	368	0	0	0
2	6,737,000	20	39	59	22	69	91	0	0	0
3	13,524,000	40	78	118	4	36	40	36	42	78
4	6,854,000	20	39	59	49	25	74	0	14	0
5	8,835,000	26	41	67	175	4/	175	0	41	0
6	2,025,000	6	12	18	10	22	32	0	0	0
7	1,682,000	5	10	15	23	15	38	0	0	0
8	5,880,000	17	34	51	51	22	73	0	12	0
9	8,046,000	24	46	70	316	84	400	0	0	0
10	14,069,000	41	81	122	432	507	939	0	0	0
LMR	67,652,000	199	380	579	1,082	1,148	2,230	0	0	0

1/ Includes stream areas.
2/ Lakes having more than 500 acres of surface area.
3/ Lakes between 40 and 499 acres in size.
4/ Less than 1,000 acres.

their needs in bordering WRPA's without significant travel, but no reasonable supply of small lakes existed to satisfy the deficits in WRPA's 3, 4, and 5. Due to the aforementioned lack of detailed use data for 1970, an assessment could not be made of needs satisfaction through intra-regional travel.

Future Needs. Significant increases in population, per capita income, and leisure time during the study's 50-year time frame will generate major increases in water-oriented recreation needs. While population is expected to about double, the recreation needs will almost triple by the year 2020 for both Programs A and B. Most of the increase in needs will be centered in or near the region's major metropolitan centers in WRPA's 3, 8, 9, and 10. Table 32 provides a summary of future recreation needs for water surface area.

The demand for quality outdoor recreation sites will increase greatly in the future.

Table 32 - Future Needs, Water Surface for Water Dependent Recreation, Lower Mississippi Region

		Needs 1,000 Acres 1/					
		Program A			Program B		
WRPA 2/	Year	Large Lake 3/	Small Lake 4/	Total Water Surface	Large Lake 3/	Small Lake 4/	Total Water Surface
2	1980	41	67	108	44	73	117
	2000	65	97	162	74	111	185
	2020	103	143	246	122	170	292
3	1980	92	153	245	102	169	271
	2000	182	271	453	210	313	523
	2020	333	461	794	394	549	943
4	1980	41	69	110	45	76	121
	2000	67	109	176	77	115	192
	2020	107	149	256	124	173	297
5	1980	56	92	148	60	99	159
	2000	95	142	237	110	163	273
	2020	157	217	374	182	253	435
6	1980	12	19	31	13	21	34
	2000	17	26	43	18	27	45
	2020	25	36	61	28	39	67
7	1980	11	17	28	12	19	31
	2000	18	25	43	21	30	51
	2020	28	39	67	34	48	82
8	1980	40	67	107	44	72	116
	2000	75	112	187	85	126	211
	2020	130	180	310	150	210	360
9	1980	50	83	133	54	89	143
	2000	82	122	204	94	141	235
	2020	129	180	309	147	206	353
10	1980	96	160	256	104	173	277
	2000	178	264	442	202	301	503
	2020	309	428	737	357	499	856
LMR	1980	439	727	1,166	478	791	1,269
	2000	779	1,168	1,947	891	1,327	2,218
	2020	1,321	1,833	3,154	1,538	2,147	3,685

1/ Gross needs.
2/ Needs are not expressed for WRPA 1 since it is considered to have no resident population.
3/ Lakes with more than 500 acres of surface area.
4/ Lakes between 40 and 499 acres in size.

Sport Fishing

Present Status. Sport fishing is a popular leisure time activity among study area residents. The region's lakes, ponds, streams, and estuaries constitute a fishery resource which accommodated an estimated 27.8 million angler-days of usage in 1970. About 40 percent of this usage was attributable to fishing in lakes; the remainder was equally divided among ponds, streams, and estuaries. Total resource availability far exceeded use in 1970, except in the case of fully utilized streams. Problems in accommodating sport fishermen on streams and ponds stemmed largely from inadequate public access. Furthermore, in some areas streams were so polluted they could not be fished.

Sport fishing is a popular leisure time activity in the region.

Table 33 gives a summary of the 1970 availability and use of the region's sport fishing resource.

Future Needs. Total need for all types of sport fishing is expected to about double by the year 2020 for both Programs A and B.

Table 33 - Sport Fishing Summary, 1970 Use of Existing Habitat, Lower Mississippi Region

	Existing Habitat (1,000 Acres)1/					Habitat Capability (1,000 Angler-Days)2/					Habitat Need, 1970 (1,000 Angler-Days)3/				
WRPA	Lakes	Ponds	Estuaries	Streams4/	Total	Lakes	Ponds	Estuaries5/	Streams	Total	Lakes	Ponds	Estuaries5/	Streams	Total
1 6/	368	0	0	7/	368	12,144	0	0	0	12,144	0	0	0	0	0
2	189	52	0	1,203	241	6,237	1,040	0	882	8,159	1,190	521	146	769	2,626
3	72	104	0	822	176	2,376	2,080	0	603	5,059	2,389	1,045	294	1,543	5,271
4	207	54	0	1,100	261	6,831	1,080	0	806	8,717	1,211	530	149	782	2,672
5	251	68	0	1,931	319	8,283	1,360	0	1,415	11,058	1,561	683	214	1,008	3,466
6	72	16	0	536	88	2,376	320	0	393	3,089	358	157	54	231	800
7	94	14	0	450	108	3,102	280	0	330	3,712	297	130	45	192	664
8	118	46	0	400	164	3,894	920	0	293	5,107	1,039	454	827	671	2,991
9	538	62	545	928	1,145	17,754	1,240	3,270	680	22,944	1,421	622	656	918	3,617
10	1,158	108	2,736	329	4,002	38,214	2,160	16,416	241	57,031	2,486	1,087	2,637	1,605	7,815
LMR	3,067	524	3,281	7,699 8/	6,872	101,211	10,480	19,686	5,643	137,020	11,952	5,229	5,022	7,719	29,922

1/ This habitat is only partially available to the public for fishing.
2/ Total given in Appendix Q disaggregated to specific habitat types and WRPA's based on use rates established in Appendix Q.
3/ Data on actual 1970 use unavailable.
4/ Stream habitat given in miles, not included in total.
5/ Anglers in WRPA's without estuarine habitat used available habitat in WRPA's 9 and 10.
6/ No needs expressed for WRPA 1 since it has no resident population.
7/ Although the Mississippi River in WRPA 1 is not considered suitable for a quality stream fishing experience, it has some potential to satisfy needs.
8/ Only that portion of the region's total stream mileage considered suitable for stream fishing as of 1970. Program components, as water quality control, will make more streams suitable in the future.

Table 34 provides a summary of future sport fishing needs expressed in angler-days for the region. Habitat required to meet those needs is shown in table 35.

Environmental Quality

Present Status. Water bodies identified as significant environmental quality components comprise about 446,000 acres of surface area in lakes and about 28,000 acres of surface area in 2,362 miles of rivers and streams. They include natural lakes, rivers, and streams of notable scenic beauty and high aesthetic value. Almost one out of every 3 miles of environmentally significant rivers and streams has been named in enacted or pending scenic rivers legislation of the States; and 98 percent of the lake acreage is presently under some form of protective ownership or management. However, legal access to many scenic lakes is inadequate to permit full enjoyment of their environmental quality attributes. Moreover, their sparsely developed shorelines, now largely covered with bottom-land hardwoods, are subject to alteration at any time that economic conditions warrant timber removal to make open space for agricultural developments, or to provide raw material for industry.

Future Needs. Primary needs relative to significant water surface areas are to maintain or enhance existing environmental quality attributes and to assure public access to the areas. A large unique physiographic feature (Crowley's Ridge) in WRPA 2 could be environmentally enhanced by the creation of numerous small lakes, totaling 10,000 acres of surface area.

Table 36 provides a summary of environmental quality water surface needs, an estimate of that portion under adequate control, and net needs.

Summary of Water Surface Needs

Water surface area needs are summarized by use category in tables 37 and 38. The recreation, fish and wildlife, and environmental quality needs are not additive because they can be mutually satisfied through multi-use of the resources. Thus, only the largest needs are given in the column of total needs.

The Environmental Quality Objective needs, summarized in table 38, include the Environmental Quality components and the needs for Recreation and Fish and Wildlife developed in connection with Program A.

Regional needs for water surface area are shown graphically on figure 6.

Table 34 - Summary of Future Sports Fishing Needs, Lower Mississippi Region

WRPA	Year	PROGRAM A 1,000 Angler Days				PROGRAM B 1,000 Angler Days			
		Lakes 1/	Ponds 2/	Estuaries 3/	Streams	Lakes 1/	Ponds 2/	Estuaries 3/	Streams
2	1980	1,203	526	148	771	1,292	565	159	834
	2000	1,334	584	164	862	1,495	654	184	965
	2020	1,572	688	193	1,015	1,829	800	225	1,181
3	1980	2,726	1,193	335	1,760	2,994	1,310	368	1,933
	2000	3,717	1,626	457	2,401	4,226	1,849	520	2,729
	2020	5,079	2,222	625	3,280	5,898	2,580	725	3,809
4	1980	1,222	535	150	790	1,334	584	164	861
	2000	1,368	598	168	883	1,551	679	191	1,002
	2020	1,637	716	201	1,057	1,861	814	229	1,202
5	1980	1,650	722	226	1,066	1,754	767	240	1,133
	2000	1,948	852	266	1,258	2,209	966	302	1,426
	2020	2,392	1,047	326	1,545	2,723	1,191	370	1,758
6	1980	345	151	52	223	368	161	55	237
	2000	349	153	52	226	367	160	55	237
	2020	382	167	57	246	419	183	63	271
7	1980	312	136	47	201	345	151	52	223
	2000	357	156	54	231	416	182	62	268
	2020	429	188	64	277	502	220	75	324
8	1980	1,190	521	947	769	1,283	561	1,021	828
	2000	1,526	668	1,214	986	1,709	748	1,360	1,103
	2020	1,984	868	1,579	1,281	2,251	985	1,791	1,454
9	1980	1,482	648	684	957	1,586	694	732	1,024
	2000	1,677	734	774	1,083	1,899	831	876	1,227
	2020	1,965	860	906	1,269	2,209	967	1,019	1,427
10	1980	2,846	1,245	3,019	1,838	3,071	1,344	3,258	1,983
	2000	3,637	1,591	3,858	2,349	4,056	1,775	4,303	2,619
	2020	4,717	2,064	5,004	3,046	5,352	2,341	5,678	3,457
LMR	1980	12,976	5,677	5,608	8,375	14,027	6,137	6,049	9,056
	2000	15,913	6,962	7,007	10,279	17,928	7,844	7,853	11,576
	2020	20,157	8,820	8,955	13,016	23,044	10,081	10,175	14,883

1/ All lakes larger than 2 acres in size,

2/ Less than 2 acres in size.

3/ Needs expressed for WRPA's 2 through 8 must be satisfied through use of available resource in WRPA's 9 and 10.

Table 35 - Summary of Future Sport Fishing Habitat Needs, Lower Mississippi Region

		PROGRAM A				PROGRAM B			
		(1,000 Acres)			(Miles)	(1,000 Acres)			(Miles)
WRPA	Year	Lakes 1/	Ponds 2/	Estuaries 3/	Streams	Lakes 1/	Ponds 2/	Estuaries 3/	Streams
2	1980	36	26	25	1,052	39	28	25	1,137
	2000	40	29	27	1,176	45	33	27	1,316
	2020	48	34	32	1,385	55	40	32	1,611
3	1980	83	60	56	2,401	91	66	61	2,637
	2000	113	81	76	3,275	128	92	87	3,723
	2020	154	111	104	4,474	179	129	121	5,196
4	1980	37	27	25	1,077	40	29	27	1,174
	2000	41	30	28	1,204	47	34	32	1,366
	2020	50	36	33	1,442	56	41	38	1,639
5	1980	50	36	41	1,454	53	38	40	1,545
	2000	59	43	44	1,716	67	48	50	1,945
	2020	72	52	54	2,107	83	60	61	2,398
6	1980	10	8	9	304	11	8	9	323
	2000	11	8	9	308	11	8	9	323
	2020	12	8	9	335	13	9	9	369
7	1980	9	7	8	274	10	8	9	304
	2000	11	8	9	315	13	9	10	365
	2020	13	9	11	377	15	11	12	442
8	1980	36	26	158	1,049	39	28	170	1,129
	2000	46	33	202	1,345	52	37	227	1,504
	2020	60	43	263	1,740	68	49	298	1,983
9	1980	45	32	114	1,305	48	35	122	1,396
	2000	51	37	129	1,477	57	42	146	1,673
	2020	60	43	151	1,731	67	48	170	1,946
10	1980	86	62	503	2,507	93	67	543	2,705
	2000	110	80	643	3,204	123	89	717	3,572
	2020	143	103	834	4,155	162	117	946	4,716
LMR	1980	393	284	939	11,423	424	307	1,006	12,350
	2000	482	349	1,167	14,020	543	392	1,305	15,787
	2020	612	439	1,491	17,746	698	504	1,687	20,300

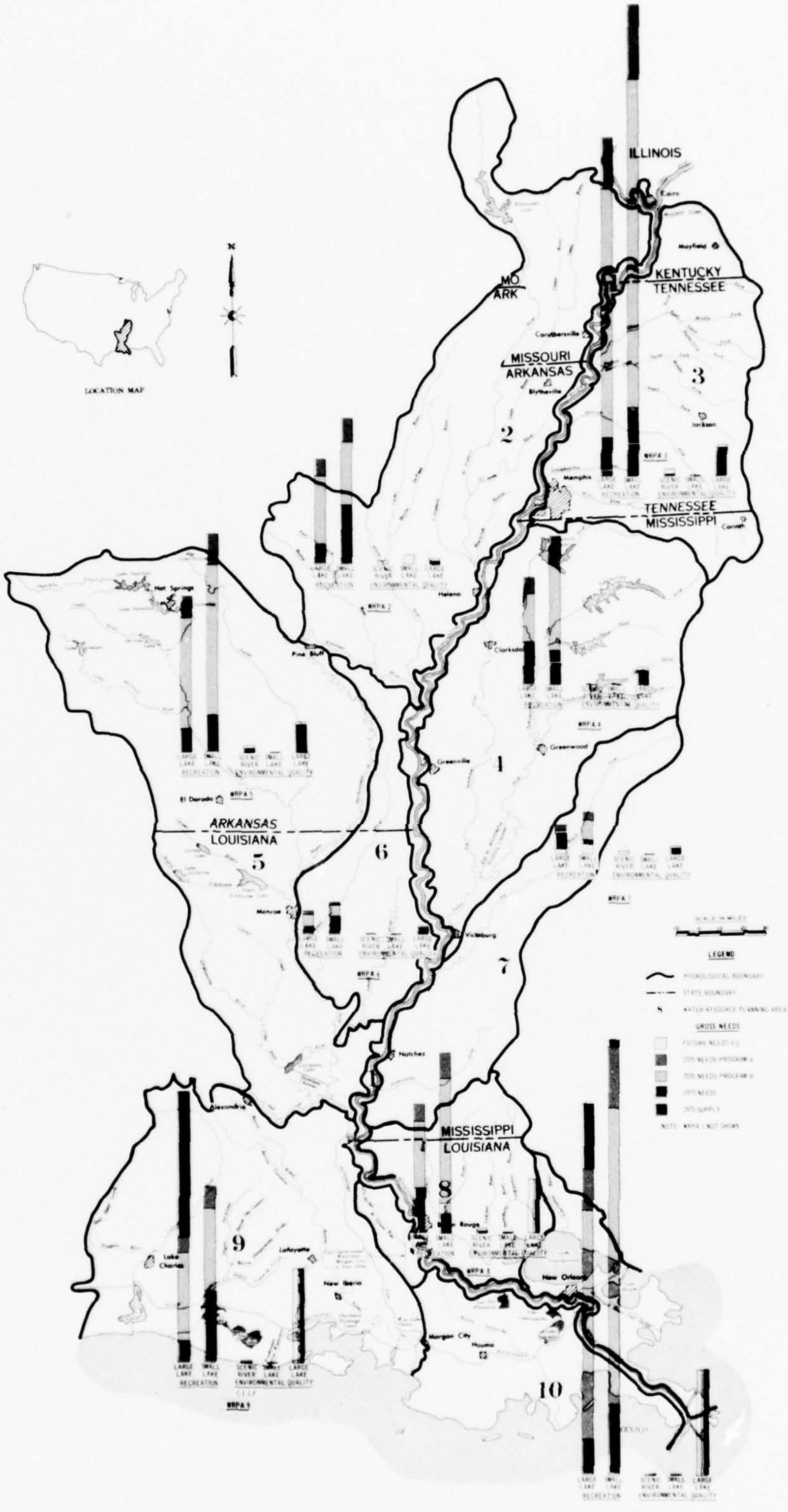
1/ All lakes larger than 2 acres in size.
2/ Less than 2 acres in size.
3/ Needs expressed for WRPA's 2 through 8 must be satisfied through use of available resource in WRPA's 9 and 10.

Table 36 - Summary of Water Surface Area Needs for Natural Environmental Quality, Lower Mississippi Region[1/]

WRPA	SMALL WATER (1,000 Acres) Scenic Rivers & Streams Gross Need	Supply	Net Need	Lakes Gross Need	Supply	Net Need	LARGE WATER (1,000 Acres) Lakes Gross Need	Supply	Net Need	TOTAL (1,000 Acres) Gross Need	Supply	Net Need
1	0	0	0	0	0	0	40	36	4	40	36	4
2	4	0	4	10	0	10	6	5	1	20	5	15
3	7	1	6	0	0	0	34[4/]	33[4/]	1[4/]	41	34	7
4	0	0	0	0	0	0	20	17	3	20	17	3
5	7	4	3	0	0	0	34[5/]	33[6/]	1	41	37	4
6	0	0	0	0	0	0	9	8	1	9	8	1
7	3	0	3	0	0	0	8	7	1	11	7	4
8	4	2	2	0	0	0	61	61	0	65	63	2
9	2	1	1	0	0	0	110	110	0	112	111	1
10	1	1	0	0	0	0	124	124	0	125	125	0
LMR	28	9	19	10	0	10	446	434	12	484	443	41

1/ Needs are for 1980 and constant for succeeding years.
2/ Between 2 and 40 acres in size.
3/ Over 40 acres in size.
4/ Also serves as unique geological and ecological systems.
5/ Of this, 31,000 acres also serve as unique ecological systems.
6/ Of this, 30,000 acres also serve as unique ecological systems.

The Ouachita River in WRPA 5 is one of numerous scenic streams that deserve special recognition and protection because of their natural environmental quality attributes.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

WATER SURFACE AREA NEEDS FOR RECREATION AND ENVIROMENTIAL QUALITY

FIGURE 6

Table 37 - Summary of Water Surface Needs, National Income and Regional Development Objectives, Lower Mississippi Region

Location	Time Frame	National Income Objective: Lakes: Recreation[1/] (1,000 Ac.)	National Income Objective: Lakes: Fish and Wildlife (1,000 Ac.)	National Income Objective: Lakes: Total (1,000 Ac.)	National Income Objective: Ponds: Fish and Wildlife (1,000 Ac.)	National Income Objective: Rivers and Streams: Fish and Wildlife (Miles)	Regional Development Objective: Lakes: Recreation[1/] (1,000 Ac.)	Regional Development Objective: Lakes: Fish and Wildlife (1,000 Ac.)	Regional Development Objective: Lakes: Total (1,000 Ac.)	Regional Development Objective: Ponds: Fish and Wildlife (1,000 Ac.)	Regional Development Objective: Rivers and Streams: Fish and Wildlife (Miles)
WRPA 1[2/]	1980	-	-	-	-	-	-	-	-	-	-
	2000	-	-	-	-	-	-	-	-	-	-
	2020	-	-	-	-	-	-	-	-	-	-
WRPA 2	1980	108	36	108	26	1,052	117	39	117	28	1,137
	2000	162	36	162	29	1,176	185	45	185	33	1,316
	2020	246	40	246	34	1,385	292	55	292	40	1,611
WRPA 3	1980	245	83	245	60	2,401	271	91	271	66	2,637
	2000	453	113	453	81	3,275	523	128	523	92	3,723
	2020	794	154	794	111	4,474	943	179	943	129	5,196
WRPA 4	1980	110	37	110	27	1,077	121	40	121	29	1,174
	2000	176	41	176	30	1,204	192	47	192	34	1,366
	2020	256	50	256	36	1,442	297	56	297	41	1,639
WRPA 5	1980	148	50	148	36	1,454	159	53	159	38	1,545
	2000	237	59	237	43	1,716	273	67	273	48	1,945
	2020	374	72	374	52	2,107	435	83	435	60	2,398
WRPA 6	1980	31	10	31	8	304	34	11	34	8	323
	2000	43	11	43	8	308	45	11	45	8	323
	2020	61	12	61	8	335	67	13	67	9	369
WRPA 7	1980	28	9	28	7	274	31	10	31	8	304
	2000	43	11	43	8	315	51	13	51	9	365
	2020	67	13	67	9	377	82	15	82	11	442
WRPA 8	1980	107	36	107	26	1,049	116	39	116	28	1,129
	2000	187	46	187	33	1,345	211	52	211	37	1,504
	2020	310	60	310	43	1,740	360	68	360	49	1,983
WRPA 9	1980	133	45	133	32	1,305	143	48	143	35	1,396
	2000	204	51	204	37	1,477	235	57	235	42	1,673
	2020	309	60	309	43	1,731	353	67	353	48	1,946
WRPA 10	1980	256	86	256	62	2,507	277	93	277	67	2,705
	2000	442	110	442	80	3,204	503	123	503	89	3,572
	2020	737	143	737	103	4,155	856	162	856	117	4,716
LMR	1980	1,166	393	1,166	284	11,423	1,269	424	1,269	307	12,350
	2000	1,947	482	1,947	349	14,020	2,218	543	2,218	392	15,787
	2020	3,154	612	3,154	439	17,746	3,685	698	3,685	504	20,300

1/ Need is for water surface 40 acres and larger, could be satisfied either by lakes, rivers, or large streams.
2/ Needs were not developed for WRPA 1, but WRPA 1's resources may satisfy needs.

Table 38 - Summary of Water Surface Area Needs, Environmental Quality Objective, Lower Mississippi Region

Location	Time Frame	Lakes: Recreation[1/] (1,000 Ac.)	Lakes: Fish and Wildlife (1,000 Ac.)	Lakes: Natural Environmental Quality Components (1,000 Ac.)	Lakes: Total (1,000 Ac.)	Ponds: Fish and Wildlife (1,000 Ac.)	Rivers and Streams: Natural Environmental Quality Components (1,000 Ac.)	Rivers and Streams: Natural Environmental Quality Components (Miles)	Rivers and Streams: Fish and Wildlife (Miles)	Rivers and Streams: Total (Miles)	Estuaries: Fish and Wildlife (1,000 Ac.)
WRPA 1[2/]	1980	-	-	40	40	-	-	-	-	-	-
	2000	-	-	40	40	-	-	-	-	-	-
	2020	-	-	40	40	-	-	-	-	-	-
WRPA 2	1980	108	36	16	108	26	4	367	1,052	1,052	25
	2000	162	36	16	162	29	4	367	1,176	1,176	27
	2020	246	40	16	246	34	4	367	1,385	1,385	32
WRPA 3	1980	245	83	34	245	60	7	570	2,401	2,401	56
	2000	453	113	34	453	81	7	570	3,275	3,275	76
	2020	794	154	34	794	111	7	570	4,474	4,474	104
WRPA 4	1980	110	37	20	110	27	0	0	1,077	1,077	25
	2000	176	41	20	176	30	0	0	1,204	1,204	28
	2020	256	50	20	256	36	0	0	1,442	1,442	33
WRPA 5	1980	148	50	34	148	36	7	547	1,454	1,454	41
	2000	237	59	34	237	43	7	547	1,716	1,716	44
	2020	374	72	34	374	52	7	547	2,107	2,107	54
WRPA 6	1980	31	10	9	31	8	0	-	304	304	9
	2000	43	11	9	43	8	0	-	308	308	9
	2020	61	12	9	61	8	0	-	335	335	9
WRPA 7	1980	28	9	8	28	7	3	266	274	274	8
	2000	43	11	8	43	8	3	266	315	315	9
	2020	67	13	8	67	9	3	266	377	377	11
WRPA 8	1980	107	36	61	107	26	4	342	1,049	1,049	158
	2000	187	46	61	187	33	4	342	1,345	1,345	202
	2020	310	60	61	310	43	4	342	1,740	1,740	263
WRPA 9	1980	133	45	110	133	32	2	179	1,305	1,305	114
	2000	204	51	110	204	37	2	179	1,477	1,477	129
	2020	309	60	110	309	43	2	179	1,731	1,731	151
WRPA 10	1980	256	86	124	256	62	1	90	2,507	2,507	503
	2000	442	110	124	442	80	1	90	3,204	3,204	643
	2020	737	143	124	737	103	1	90	4,155	4,155	834
LMR	1980	1,166	393	434	1,206	284	28	2,362	11,423	11,423	939
	2000	1,947	482	434	1,987	349	28	2,362	14,020	14,020	1,167
	2020	3,154	612	434	3,194	439	28	2,362	17,746	17,746	1,491

1/ Need is for water surface 40 acres and larger could be satisfied by lakes, rivers, or large streams.

2/ Recreation and Fish and Wildlife Needs were not developed for WRPA 1 but that area's resource may satisfy needs.

Land Area

More than ever before, land today is called upon to satisfy a multiplicity of competing needs. This competition will intensify with population growth and increasing demands for food and fiber, minerals, industrial products, and recreation sites. Because land use capability is limited, it is imperative that all needs expressed in plan formulation be in terms of commensurate management levels for each land use so that every acre can be efficiently utilized.

The region's finite land resource must be managed so as to satisfy as many as possible of the demands in competition for it.

Land needs presented in the various appendixes span a wide range of management levels. Each land use need has therefore been critically analyzed as a preliminary step to land use allocation and some needs have been adjusted to achieve overall compatibility among identified land needs. These adjustments are discussed in the subsequent narrative.

Land areas are herein classified cropland, permanent pasture, pastured cropland, forest land (including pastured forests), transportation,

urban and built-up lands, mineral lands, recreation lands, fish and wildlife lands, environmental quality lands, and other lands which include not only tracts of agricultural lands unavoidable idle as a part of the cropland mix, but also miscellaneous lands, rural roads, non-forested public lands, and the like. Croplands, pasturelands, and forest lands are used not only for food and fiber production, but also for wildlife purposes. Both open lands and forest lands are used for recreation and environmental quality purposes. Urban and built-up lands are used for residential, commercial, and industrial purposes. They are also used for recreation and environmental quality purposes and include transportation facilities. Other lands are used for a variety of purposes, including fish and wildlife habitat (wetlands), commercial fish farming, and minerals production.

Some lands presently serve several uses. Proper planning for the future involves allocating land so as to serve even more purposes while maintaining diversity.

Cropland

Present status. In 1970 cropland in the region totaled 17,343,000 acres, or nearly half of the regional land suitable for continuous cropping. Approximately 15.6 million acres were harvested and produced

$1.8 billion in crop marketing receipts. The harvest included 4.3 million bales of cotton, 182 million bushels of soybeans, 91 million bushels of rice, 39 million bushels of corn, 11 million bushels of wheat, 8 million tons of sugarcane, and substantial quantities of other commodities such as food and feed grains, tobacco, sorghum, peanuts, peas, potatoes, and hay. In addition, truck farms have steadily increased their output of vegetables and other fresh farm products in recent years to serve rapidly expanding urban centers in the region. Table 39 shows regional cropland distribution as of 1970.

Table 39 - Cropland Distribution, 1970, Lower Mississippi Region

WRPA	Cropland1/ (1,000 Ac.)	Distribution (Percent)
1	188	1
2	6,192	36
3	2,206	13
4	3,314	19
5	732	4
6	1,908	11
7	337	2
8	329	2
9	1,827	10
10	310	2
LMR	17,343	100

1/ Data from Conservation Needs Inventory; includes idle cropland.

Future Needs. Regionwide food and fiber production requirements based on 1972 OBERS projections are expected to more than double by year 2020. Satisfaction of these production goals consistent with the satisfaction of competing resource needs will require that land be put into crop production, and further require that agricultural yields be

increased through water resources and land developments such as flood control, drainage, irrigation, and land treatment. Table 40 illustrates the increase in Program A production requirements for the region's major crops. Table 41 summarizes future cropland needs.

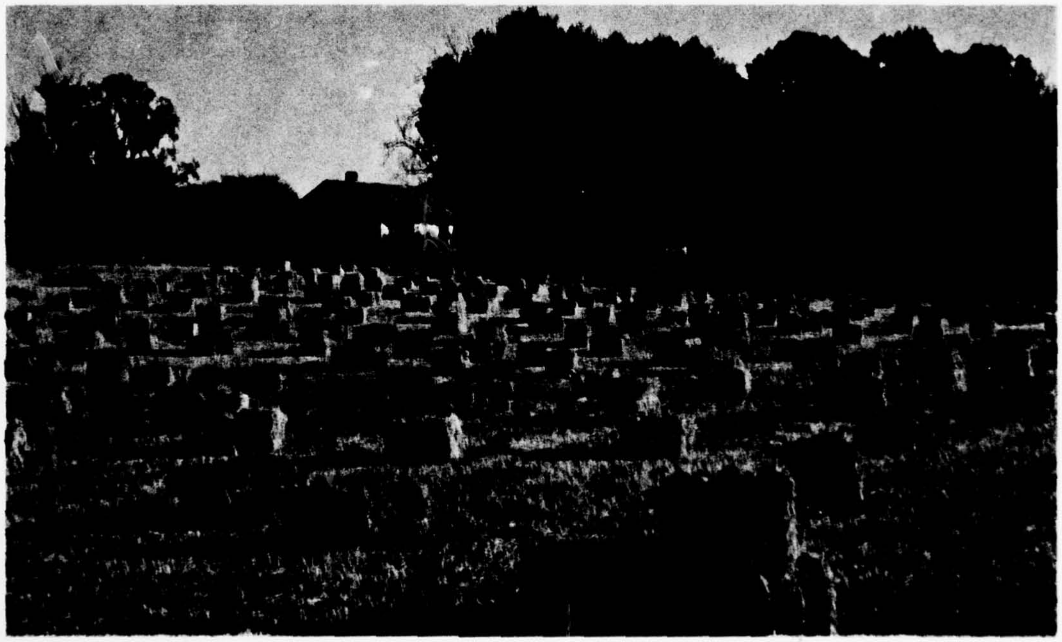
The needs expressed herein for cropland represent the amount of land which, in the absence of post-1970 resource development for flood control, agricultural drainage, or supplemental irrigation, must be used for crop production if the region is to contribute at the minimum cost its required share of the Nation's future food and fiber. The methodology for calculating cropland needs (Appendix F, Land Resources) embodies the assumption that the 1970 level of resource development will (with one exception) be maintained throughout the study period, and that major crop enterprises will shift to their least-cost location within limits of land capabilities. The exception is that cropland needs for rice production reflect additional resource development for irrigation essential to that crop. Thus, the expressed future cropland acreages are not land use projections, but rather lands required to produce specified amounts of food and fiber at the minimum cost consistent with soil and resource development restraints. This approach results in quantified cropland needs which are conservative by virtue of the fact that nearly complete mobility of land use is not realistic and is unlikely to prevail. Even supposing that owners are amenable to such changes in land use, in the time frames required, educational considerations alone would preclude attainment of maximum efficiency for many years.

Table 40 - Production Requirements for Selected Crops Related to Food and Fiber, Program A, Lower Mississippi Region

Commodity	Unit of Measurement	1970 Production (1000's)	2020[1/] Production Requirements
Cotton	Bale	4,317	4,580
Soybeans	Bushel	182,109	488,828
Rice	Bushel	91,495	162,426
Corn	Bushel	38,851	35,428
Wheat	Bushel	10,889	67,980
Sugarcane	Ton	8,291	19,109

1/ 1972 OBERS data

Soybeans, the number one crop in the region in 1970, accounted for over one-half the total cropland harvested that year.



Hay is a principal crop in the region, ranking behind soybeans, cotton, and rice in number of acres harvested in 1970.

Table 41 - Future Cropland Needs, Lower Mississippi Region[1]

WRPA	Program	1970[2] Use (1,000 Acres)	Future Need (1,000 Acres)[3] 1980	2000	2020
1	A	188	188	188	188
	B		188	188	188
2	A	6,192	7,201	7,618	7,761
	B		7,201	8,142	8,216
3	A	2,206	2,094	2,170	2,346
	B		2,094	2,285	2,459
4	A	3,314	3,545	4,274	4,457
	B		3,545	4,662	4,904
5	A	732	592	560	569
	B		592	625	626
6	A	1,908	2,225	2,374	2,637
	B		2,225	2,566	2,778
7	A	337	197	147	104
	B		197	170	130
8	A	329	217	170	193
	B		217	204	216
9	A	1,827	2,673	2,623	2,578
	B		2,673	2,772	2,814
10	A	310	271	250	242
	B		271	276	265
LMR	A	17,343	19,203	20,374	21,075
	B		19,203	21,890	22,596

1/ Based on 1972 OBERS data. See table 50, Appendix F, Land Resources

2/ Includes 1,702,000 acres of idle cropland.

3/ Harvested cropland only. Idle cropland for 1980, 2000, and 2020 is included in "other lands" category.

Pasture

Present Status. Nearly 14 million acres of the region's land were pastured in 1970. Of this, 2,871,000 acres were pastured cropland (not included in previously discussed cropland use or needs), 6,782,000 acres were permanent pasture, and 4,207,000 acres were pastured forests. This pasturage supported production of 5,521,700 head of livestock, primarily cattle, calves, and milk cows. WRPA 5 in Arkansas and Louisiana was the leading livestock producer in terms of livestock marketing receipts and in terms of pasture acreage, but ranked fourth in terms of cattle and calves. The bulk of WRPA 5's marketing receipts were from poultry and poultry products. WRPA 4 ranked first in number of cattle and calves, third in livestock marketing receipts, and fourth in pasture acreage. Table 42 provides a summary of pasture land distribution as of 1970.

Table 42 - Lands Used for Pasture in 1970, Lower Mississippi Region

Planning Area	1970 Use: Pastured Cropland	Permanent Pasture (1,000 Acres)	Pastured Forests	TOTAL	Distribution (Percent)
1	30	32	135	197	1
2	380	693	365	1,438	11
3	746	929	297	1,972	14
4	326	943	587	1,856	13
5	239	982	947	2,168	16
6	118	494	117	729	5
7	180	941	694	1,815	13
8	54	655	650	1,359	10
9	749	911	383	2,043	15
10	49	202	32	283	2
LMR	2,871	6,782	4,207	13,860	100

pastured cropland

permanent pasture

pastured forests

The three types of pasture lands found in the region are shown above.

Future Needs. Increased production of meat and dairy products and other foodstuffs will be required to feed the future population of the region and the Nation. Needs for beef and veal will increase sharply, almost doubling between 1970 and 1980, and further increasing to about 3.5 times today's production levels in 2020. Need for milk products in 2020 will have increased to about one and one-half today's production levels. Program B requirements are about 7 percent higher than for Program A. Table 43 displays production requirements for Program A. Pastureland acreage requirements are shown in tables 44 and 45, as Appendix F needs and "adjusted" needs. Acreage needs for pastureland presented in the Land Resources Appendix are based on an extension of historical trends, whereas the adjusted figures represent a near-optimum level of management. Livestock production has been a secondary poorly managed agricultural enterprise in the region except for registered cattle herds. Consequently, adjustment of these needs was required. Proper management practices such as seeding, fertilization, clipping, and proper cattle/acre ratio, were considered in arriving at percentage factors for reducing needed acreages to those levels shown as adjusted needs. This adjustment tends to reconcile pasture needs with those for cropland according to a common management base. Adjustments were made across the board to pastured cropland, permanent pasture, and pastured forests, for both Programs A and B by multiplying the 1980, 2000, and 2020 Appendix F figures by 85, 65, and 50 percent, respectively.

Total regional pastureland needs are expected to be about one and one-half times larger than 1970 use by the year 2000, with still further increases by 2020.

Table 43 - Production Requirements for Beef and Veal, and Milk Products, Program A, Lower Mississippi Region

	Production Requirements, 1000's lbs.1/	
Year	Beef and Veal2/	Milk Products
1970	883,504	1,364,944
1980	1,604,822	1,450,000
2000	2,264,531	1,757,500
2020	3,141,474	2,121,300

1/ 1972 OBERS data

2/ Net Liveweight

Table 44 - Future Pastureland Needs, Program A, Lower Mississippi Region

WRPA	Year	Pastured Cropland Appx F 1/ (1,000 Acres)	Pastured Cropland Adjusted (1,000 Acres)	Permanent Pasture Appx F 1/ (1,000 Acres)	Permanent Pasture Adjusted (1,000 Acres)	Pastured Forests Appx F 1/ (1,000 Acres)	Pastured Forests Adjusted (1,000 Acres)	Total Pasture Appx F 2/ (1,000 Acres)	Total Pasture Adjusted (1,000 Acres)
1	1980	30	30	32	32	135	135	197	197
	2000	30	30	32	32	135	135	197	197
	2020	30	30	32	32	135	135	197	197
2	1980	589	501	370	314	526	447	1,485	1,262
	2000	775	504	491	319	698	454	1,964	1,277
	2020	1,028	514	652	326	927	464	2,607	1,304
3	1980	1,314	1,117	589	501	546	464	2,449	2,082
	2000	1,876	1,219	847	551	787	512	3,510	2,282
	2020	2,628	1,314	1,166	583	1,102	551	4,896	2,448
4	1980	680	578	2,140	1,819	1,262	1,073	4,082	3,470
	2000	1,062	690	3,185	2,070	1,975	1,284	6,222	4,044
	2020	1,519	760	4,558	2,279	2,856	1,428	8,933	4,467
5	1980	658	559	1,007	856	1,233	1,048	2,898	2,463
	2000	895	582	1,356	881	1,677	1,090	3,928	2,553
	2020	1,215	608	1,842	921	2,279	1,140	5,336	2,669
6	1980	234	199	550	468	263	224	1,047	891
	2000	320	208	753	489	360	234	1,433	931
	2020	438	219	1,030	515	493	246	1,961	980
7	1980	371	315	1,198	1,018	1,472	1,251	3,041	2,584
	2000	547	356	1,786	1,161	2,196	1,427	4,529	2,944
	2020	782	392	2,557	1,278	3,130	1,565	6,470	3,235
8	1980	411	349	691	587	724	615	1,826	1,551
	2000	565	367	947	616	1,002	651	2,514	1,634
	2020	782	391	1,299	650	1,375	688	3,456	1,729
9	1980	1,548	1,316	1,261	1,072	796	677	3,605	3,065
	2000	2,128	1,383	1,733	1,126	1,094	711	4,955	3,220
	2020	2,899	1,450	2,357	1,178	1,502	751	6,758	3,379
10	1980	106	90	347	295	69	59	522	444
	2000	146	95	474	308	95	62	715	465
	2020	200	100	649	324	130	65	979	489
LMR	1980	5,941	5,054	8,185	6,962	7,026	5,993	21,152	18,009
	2000	8,344	5,434	11,604	7,553	11,019	6,560	30,967	19,547
	2020	11,522	5,778	16,142	8,086	13,929	7,033	41,593	20,897

1/ Based on common mix factor applied to total pasture acreage.
2/ Appendix F, Land Resources, Table 52.

Table 45 - Future Pastureland Needs, Program B, Lower Mississippi Region

WRPA	Year	Pastured Cropland		Permanent Pasture		Pastured Forests		Total Pasture	
		Appx F[1]	Adjusted	Appx F[1]	Adjusted	Appx F[1]	Adjusted	Appx F[2]	Adjusted
		(1,000 Acres)		(1,000 Acres)		(1,000 Acres)		(1,000 Acres)	
1	1980	30	30	32	32	135	135	197	197
	2000	30	30	32	32	135	135	197	197
	2020	30	30	32	32	135	135	197	197
2	1980	589	501	370	314	526	447	1,485	1,262
	2000	822	534	521	339	741	482	2,084	1,355
	2020	1,104	552	700	350	995	498	2,799	1,400
3	1980	1,314	1,117	589	501	546	464	2,449	2,082
	2000	2,016	1,310	894	581	845	549	3,755	2,440
	2020	2,822	1,411	1,252	626	1,184	592	5,258	2,629
4	1980	680	578	2,140	1,819	1,262	1,073	4,082	3,470
	2000	1,141	742	3,422	2,224	2,121	1,379	6,684	4,345
	2020	1,632	816	4,895	2,448	3,067	1,533	9,594	4,797
5	1980	658	559	1,007	856	1,233	1,048	2,898	2,463
	2000	961	625	1,456	946	1,802	1,171	4,219	2,742
	2020	1,305	653	1,978	989	2,447	1,224	5,730	2,866
6	1980	234	199	550	468	263	224	1,047	891
	2000	344	224	809	526	387	252	1,540	1,002
	2020	470	235	1,106	553	529	264	2,105	1,052
7	1980	371	315	1,198	1,018	1,472	1,251	3,041	2,584
	2000	587	382	1,919	1,247	2,359	1,533	4,865	3,162
	2020	840	420	2,745	1,372	3,362	1,681	6,947	3,473
8	1980	411	349	691	587	724	615	1,826	1,551
	2000	607	395	1,017	661	1,076	699	2,700	1,755
	2020	840	420	1,395	698	1,477	739	3,712	1,857
9	1980	1,548	1,316	1,261	1,072	796	677	3,605	3,065
	2000	2,286	1,486	1,861	1,210	1,176	764	5,323	3,460
	2020	3,113	1,556	2,531	1,265	1,612	806	7,256	3,627
10	1980	106	90	347	295	69	59	522	444
	2000	157	102	509	331	102	66	768	499
	2020	215	107	697	349	140	70	1,052	526
LMR	1980	5,941	5,054	8,185	6,962	7,026	5,993	21,152	18,009
	2000	8,951	5,830	12,440	8,097	10,744	7,030	32,135	20,957
	2020	12,371	6,200	17,331	8,682	14,948	7,542	44,650	22,424

1/ Based on common mix factor applied to total pasture acreage.
2/ Appendix F, Land Resources, Table 52.

Forest Lands

Present Status. In 1970 forests occupied 29,637,000 acres, or nearly half of the total land area in the region. All but 45,000 acres was commercial forest land that supported about 27 billion cubic feet of growing stock. In recent history, there has been a steady conversion of forest acreage to other agricultural uses. Since 1959 the region's total forested acreage has declined an average of 230,000 acres per year. However, the trend has varied among the planning areas, with the greatest decreases in WRPA's 2 and 6, while slight increases have occurred in WRPA's 3, 5, and 7. Table 46 summarizes the present (1970) forested acreage and its distribution in the region.

The major forest types are longleaf-slash pine, loblolly-shortleaf pine, oak-pine, oak-hickory, oak-gum-cypress, and elm-ash-cottonwood. The oak-gum-cypress group, better known as bottom-land hardwoods, is the most plentiful type. Bottom-land hardwoods are located in the Mississippi River Delta and along the region's streams, both in the delta and upland areas, comprising about 30 percent of the total forests in the region.

The oak-gum-cypress (bottomland hardwoods) is the most common forest type in the region.

Table 46 - Forest Lands in Lower Mississippi Region, 1970

WRPA	Forest Land[1/] (1,000 Acres)	Distribution (Percent)
1	879	3
2	2,634	9
3	2,310	8
4	3,222	11
5	10,228	35
6	831	3
7	2,509	8
8	2,265	7
9	3,442	12
10	1,317	4
LMR	29,637	100

1/ Includes pastured forests.

Future Needs. The requirements for wood and wood products are expected to more than triple by the year 2020. This increase will cause a concomitant increase in the need for forest lands. This need as shown in Appendix F is overstated when viewed within the plan formulation framework that calls for mutually efficient levels of management on all lands. With future management steadily increasing to a level of near "maximum efficiency of use" of the forest lands, it is estimated that most of the need for timber products in the year 2020 can be met with production from approximately 21.6 million acres, or a little less than half the acreage needs shown in Appendix F for Program A, and on 24.1 million acres using Program B criteria. Transitive production gains from the increased management for forest products would, of course, be less. The adjustment in forest acreage, the result of a WRPA-by-WRPA analysis of productive potential made by forestry experts, varied dramatically throughout the region, depending on a complex interrelationship of many factors. For this reason, no meaningful across-the-board adjusting factor could be determined. Future forest-land needs

for wood production as shown in Appendix F and as adjusted are summarized in table 47 for both Programs A and B.

Other Lands

Present Status. In 1970, 3,506,000 acres of the region's lands were classed as other land. Such lands generally include farmsteads, rural farm roads, feed lots, levees, drainage ditches and ditch banks, fence and hedge rows, rural residences, investment tracts, coastal dunes, and mineral lands. They also include certain specific tracts such as 500,000 acres of marshlands not used for grazing in WRPA 9, 1,552,000 acres of marshland not used for grazing in WRPA 10, 81,000 acres of unforested Federal land in WRPA 5, and 41,000 acres of unforested Federal land in WRPA 10.

Farmsteads and rural farm roads are included in the category "other lands."

Future Needs. Other lands are a unique mix of miscellaneous agricultural and nonagricultural rural lands. Use of and future needs for other lands are keyed to specifically identified land uses. Regional needs for other lands are expected to increase to 1980 as a result of bringing an additional 4 million acres or more into food and fiber production. Thereafter, a steady decline is expected as a result of new

Table 47 - Future Forest Land Needs, Lower Mississippi Region

WRPA	Time Frame	Program A Needs, 1,000 Acres Appx F	Program A Needs, 1,000 Acres Adjusted 1/	Program B Needs, 1,000 Acres Appx F	Program B Needs, 1,000 Acres Adjusted
1	1980	879	879	879	879
	2000	879	879	879	879
	2020	879	879	879	879
2	1980	2,989	1,781	3,153	1,878
	2000	2,609	1,193	2,896	1,324
	2020	2,731	957	3,086	1,081
3	1980	3,495	1,721	3,845	1,892
	2000	2,862	1,423	3,205	1,593
	2020	3,066	1,019	3,465	1,152
4	1980	4,660	2,337	5,033	2,522
	2000	3,934	1,880	4,406	2,106
	2020	4,326	1,431	4,888	1,616
5	1980	14,071	10,069	14,915	10,668
	2000	17,273	10,779	19,173	11,965
	2020	19,194	10,956	21,305	12,161
6	1980	1,469	994	1,513	1,024
	2000	1,605	905	1,701	959
	2020	1,834	881	1,981	952
7	1980	3,296	1,940	3,626	2,133
	2000	3,475	1,848	3,962	2,106
	2020	3,589	1,797	4,199	2,102
8	1980	3,268	2,170	3,529	2,342
	2000	3,539	2,176	3,999	2,461
	2020	3,810	2,226	4,305	2,515
9	1980	4,446	1,846	4,757	1,973
	2000	4,780	1,405	5,258	1,545
	2020	5,135	1,018	5,700	1,130
10	1980	1,553	740	1,677	799
	2000	1,684	537	1,886	601
	2020	1,439	457	1,626	517
LMR	1980	40,126	24,477	42,927	26,110
	2000	42,640	23,025	42,927	25,539
	2020	46,003	21,621	51,434	24,105

1/ Adjusted acres reflects total management for maximum wood production efficiency.

farm efficiencies and the conversion of presently idle agricultural lands to productive uses.

WRPA variations in future needs for other lands are, in some cases, attributable to differences in the makeup of agricultural activities. In other cases they are more attributable to the relative constancy of certain component lands, as in the case of the large acreages of marshlands in WRPA's 9 and 10.

Table 48 is a summary of present use and future needs for this land.

Urban and Built-up Lands

Present Status. In 1970 there were 379 cities and towns of 1,000 or more population in the Lower Mississippi Region. These, along with numerous smaller communities and their associated transportation facilities such as highways, airports, etc., occupied about 2.3 million acres of land. Cities and towns with 2,500 or more inhabitants housed a total urban population of 3,734,123. The remaining 2,559,110 people of the region lived in numerous smaller rural towns and communities, or occupied rural farm and nonfarm residences. The 1970 urban and built-up lands are summarized by WRPA in table 49.

Skyline of Memphis, Tennessee, one of several urban centers on the Mississippi River.

Table 48 - Present Use and Future Needs for Other Lands, Lower Mississippi Region

WRPA	1970 Use (1,000 Acres)	Future Needs 1/ Time Frame	Area (1,000 Acres)
1	62	1980	62
		2000	62
		2020	62
2	247	1980	379
		2000	253
		2020	174
3	200	1980	392
		2000	379
		2020	354
4	207	1980	253
		2000	230
		2020	163
5	192	1980	202
		2000	180
		2020	137
6	32	1980	95
		2000	102
		2020	115
7	30	1980	68
		2000	49
		2020	12
8	48	1980	59
		2000	47
		2020	21
9	807	1980	734
		2000	752
		2020	787
10	1,681	1980	1,671
		2000	1,664
		2020	1,653
LMR	3,506	1980	3,915
		2000	3,718
		2020	3,478

1/ Includes idle cropland whereas 1970 use column does not.

Table 49 - Urban and Built-up Land in the Lower Mississippi Region, 1970

WRPA	Urban and Built-up Lands (1,000 Acres)
1	0
2	367
3	355
4	328
5	440
6	78
7	116
8	182
9	236
10	230
LMR	2,332

Future Needs. By the year 2020, population of the Lower Mississippi Region is expected to increase to 10,196,000, or to about 1.6 times the 1970 population under Program A projections. For Program B, population is expected to increase to 11,655,000, or about 1.9 times the present population. Concurrent with the population increase and a tenfold increase in industry, the urban-rural balance is expected to shift from 1970's 60 percent urban (places with population of 2,500 or more) to 76 percent urban in 2020. These two parameters represent a substantial aggregate growth in the future needs for land. Table 50 provides a summary of future urban and built-up land needs. Land occupied by urban and built-up areas is expected to be about one and one-half times present such use with Program A growth rates, and about 1.75 times using Program B growth rates.

Commercial Fish Farming

Present Status. About 38 million pounds of catfish and crawfish were produced in the region in 1970 in shallow man-made ponds that collectively occupied 46,000 acres of land. Because the water surface area

Table 50 - Future Needs for Urban and Built-Up Lands, Lower Mississippi Region

WRPA	Time Frame	Program A Need (1,000 Acres)	Program B Need (1,000 Acres)
1	1980	0	0
	2000	0	0
	2020	0	0
2	1980	378	392
	2000	396	448
	2020	459	541
3	1980	401	439
	2000	536	612
	2020	724	843
4	1980	335	357
	2000	361	408
	2020	426	485
5	1980	458	487
	2000	532	605
	2020	647	736
6	1980	79	79
	2000	79	82
	2020	80	88
7	1980	121	133
	2000	136	158
	2020	151	188
8	1980	206	222
	2000	260	292
	2020	333	380
9	1980	243	260
	2000	271	307
	2020	314	352
10	1980	260	280
	2000	327	365
	2020	419	476
LMR	1980	2,481	2,649
	2000	2,898	3,277
	2020	3,553	4,089

of these ponds is incidental to fish production, and does not lend itself to multiple use, the areal requirements for commercial fish farming are expressed in terms of land area rather than water surface. Water withdrawal requirements are included in the previous discussions of water needs. Table 51 shows the distribution of the 1970 use of land for commercial fish farming.

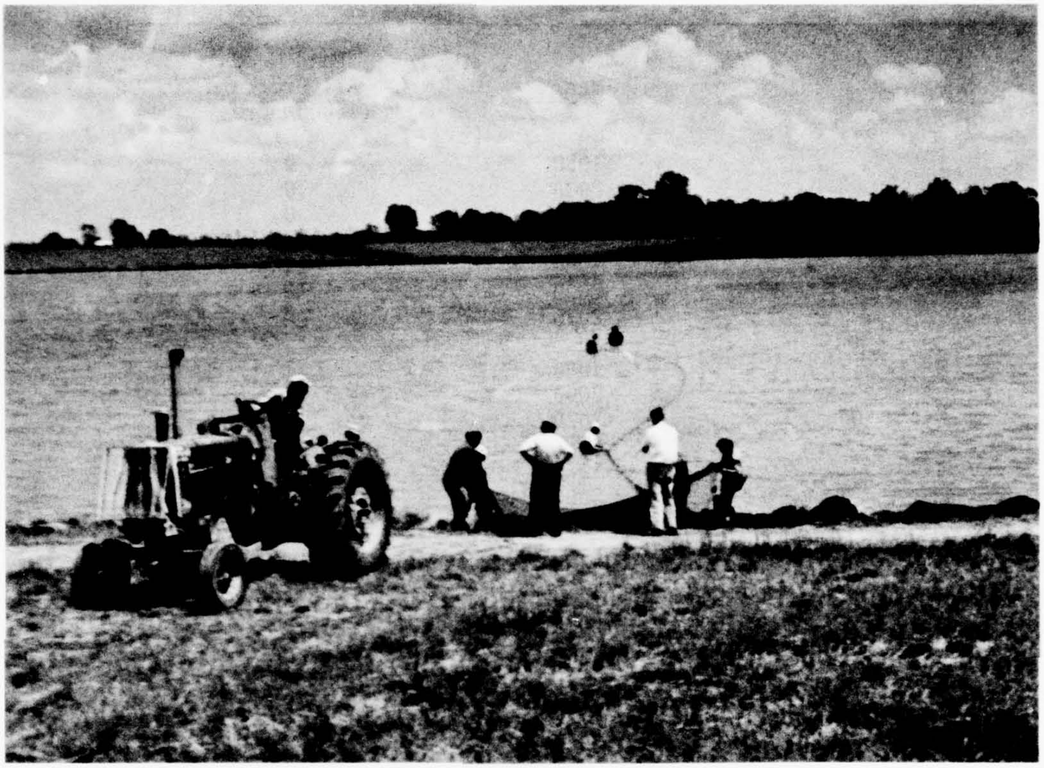
Table 51 - Commercial Fish Farming Land Use, 1970, Lower Mississippi Region

WRPA	1970 Land Use (1,000 Ac.)	Distribution (Percent)
1	0	0
2	16.0	35
3	0.6	1
4	11.3	25
5	3.6	8
6	1.4	3
7	0.9	2
8	0.3	1/
9	10.7	23
10	1.2	3
LMR	46.0	100

1/ Less than 1 percent.

Future Needs. Commercial fish production is expected to increase more than threefold by the year 2020. This increase applies to both Programs A and B growth rates because future demands under either program exceed the maximum reasonable productivity as now forecasted for commercial fish farming. The expected production from catfish and crawfish farming is discussed in the previous water withdrawal needs summary and in Appendix Q, Fish and Wildlife. Land requirements for

commercial fish farming in 2020 as summarized in table 52 are 3.5 times the 1970 use of land for this purpose.



Land requirements for commercial fish farming are expected to increase greatly in the future.

Recreation Lands

Present Status. There were nearly 100,000 acres of the region's land in a state of development suitable for outdoor recreation in 1970. These lands supported 577 million user-days of various land-dependent recreation activities. Of the total, 16,000 acres were Class A lands, 32,000 acres were Class B lands, and 51,000 acres were Class C lands. (In Appendix N, Recreation, these lands are termed Category A, B, and C lands.) Class A or Category A lands are highly developed areas in or near population concentrations and are high-density use areas. Class B lands are within a reasonable driving time from population concentrations, are of a lower intensity use than Class A lands, and have limited developments. Class C lands are more wilderness-oriented with little or no recreation development, and location with respect to population is not a major consideration. There are no current regional statistics on actual use of these lands, but estimates place 1970 needs

Table 52 - Future Land Needs for Commercial Fish Farming, Lower Mississippi Region

WRPA	Year	Land Needs All Programs (1,000 Acres)
1	1980	0
	2000	0
	2020	0
2	1980	21
	2000	30
	2020	40
3	1980	1
	2000	2
	2020	3
4	1980	20
	2000	37
	2020	54
5	1980	6
	2000	12
	2020	18
6	1980	4
	2000	9
	2020	14
7	1980	1
	2000	3
	2020	4
8	1980	1
	2000	1
	2020	2
9	1980	14
	2000	20
	2020	26
10	1980	2
	2000	3
	2020	3
LMR	1980	70
	2000	117
	2020	164

for developed areas at 182,000 acres. In addition to the nearly 100,000 acres of developed recreation lands, there were 1.1 million acres of land under suitable ownership for recreation, but most of these lands had limited access and no development, and most fell within the category of Class C lands.

High quality recreation lands, such as this camping and picnicking area in one of the region's national forests, are often located in areas remote from population concentrations.

Ignoring land classes, there are enough lands available for development to satisfy short term recreation needs on a regional basis. However, major Classes A and B resource inadequacies exist on a WRPA basis due to poor resource distribution relative to population concentrations and due to a lack of development on available acreages.

The most pronounced overcrowding of developed recreation lands presently occurs in and near the major metropolitan areas of New Orleans and Memphis. These cities account for about one-fourth of the region's people, but only 11 percent of the lands developed for recreation are contained in their respective planning areas, 10 and 3.

Table 53 contains a summary of present undeveloped and developed recreation lands, by class, in the region.

Future Needs. Outdoor recreation needs are a function of population, income, and leisure time, each of which is expected to increase substantially over the next 50 years. The 1970 population is expected to increase 1.6 or 1.9 times under Programs A and B growth rates, respectively, by the year 2020. Likewise, per capita income is expected to increase about five times under both programs. Leisure time is expected to increase due to higher incomes and increased worker productivity.

Problems in providing adequate recreation facilities for the increasing population will be compounded by a continued shift of people from rural areas and small towns to major metropolitan centers. This shift in urban-rural population balance will tend to increase present disparities in the distribution of the Classes A and B recreation lands with respect to centers of demand. Future outdoor recreation needs are summarized in table 54. A total of 497,000 acres of developed recreation land will be needed under Program A growth rates by the year 2020; and about 580,000 acres will be needed under Program B growth rates.

Fish and Wildlife Land

Present Status. Wildlife range over most of the land area in the region and migratory waterfowl depend upon the wetlands and water bodies for resting areas. Approximately 12.9 million acres, or 21 percent, of the region's lands are dedicated in varying degrees to wildlife and waterfowl management. These lands are available to the public for hunting purposes. They consist of State and Federal forests, public game preserves and refuges, public hunting areas, and privately owned lands which are available for hunting purposes. The status of these lands will probably not change in this regard within the study time frame. Slightly over 2 million acres of the total are completely controlled by State or Federal interests either by ownership or firm leasing arrangements.

Open and wooded wetlands in the Lower Mississippi Region make an important contribution to maintaining migratory waterfowl populations, being the primary wintering area for the bulk of the Mississippi flyway population. Migratory waterfowl not only satisfy national needs, but also international needs, the importance of which are recognized by treaties.

Wildlife management on public lands has become a highly effective measure in providing game for public hunting and in conserving wildlife populations as an inheritance for future generations. Because of this management, there are now more deer in the region than are thought to have existed at any other time. Also, previously decimated species, such as the American alligator, are being reintroduced to parts of the region.

Table 53 - Status of Recreation Lands in Lower Mississippi Region, 1970

WRPA	Undeveloped Supply 1/ (1,000 Acres) Class A	Class B	Class C	Total	Developed and Used for Recreation (1,000 Acres) Class A	Class B	Class C	Total
1 2/	0	0	0	0	0	0	0	0
2	32.6 3/	27.0	39.7 4/	99.3	6.1	14.1	0.6	20.8
3	9.8 4/	39.9 4/	9.2	58.9	2.9	4.7	0.2	7.8
4	4.2	13.8 4/	264.0	282.0	0.8	1.9	26.0	28.7
5	18.9 4/	16.5	341.2	376.6	2.6	4.5	23.8	30.9
6	6.1 4/	16.1 4/	0.0	22.2	0.5	0.7	0.0	1.2
7	3.0 4/	38.8 4/	210.0	251.8	0.4	0.7	0.1	1.2
8	2.4 4/	5.7	0.0	8.1	0.5	1.7	0.0	2.2
9	1.3	10.8	7.8	19.9	1.3	1.9	0.2	3.4
10	2.0	6.3	0.1	8.4	1.3	1.7	0.0	3.0
LMR	80.3	174.9	872.0	1,127.2	16.4	31.9	50.9	99.2

1/ Lands in public ownership suitable for recreation use and/or development and use. Location may not be suitable, however.
2/ Included in bordering WRPA's.
3/ Location unsuitable
4/ Location partially unsuitable.

Table 54 - Future Land Needs for Outdoor Recreation, Lower Mississippi

WRPA	Time Frame	Program A (1,000 Acres) Class A	Class B	Class C	Total	Program B (1,000 Acres) Class A	Class B	Class C	Total
2	1980	7.1	15.1	0.6	22.8	7.1	15.1	0.6	23.3
	2000	8.4	15.1	0.7	24.2	9.6	16.6	0.8	27.0
	2020	12.1	20.8	0.9	33.8	14.4	24.8	1.1	40.3
3	1980	13.8	23.8	1.2	38.8	15.3	26.3	1.3	42.9
	2000	23.5	40.5	1.9	65.9	27.2	46.8	2.2	76.2
	2020	39.0	67.2	3.0	109.2	46.4	80.0	3.5	129.9
4	1980	3.8	6.2	26.0	36.0	4.2	6.8	26.1	37.1
	2000	5.4	8.8	32.1	46.3	6.3	10.2	36.9	53.4
	2020	8.0	13.0	45.5	66.5	9.3	15.2	52.8	77.3
5	1980	6.1	10.5	23.8	40.4	6.6	11.2	23.8	41.6
	2000	9.1	15.5	31.5	56.1	10.4	17.8	36.3	64.5
	2020	13.5	23.1	46.9	83.5	15.8	26.9	54.7	97.4
6	1980	1.7	3.0	0.2	4.9	1.9	3.2	0.2	5.3
	2000	2.2	3.8	0.2	6.2	2.4	4.1	0.2	6.7
	2020	2.9	5.1	0.2	8.2	3.3	5.7	0.3	9.3
7	1980	1.6	2.7	0.1	4.4	1.8	3.0	0.1	4.9
	2000	2.2	3.9	0.2	6.3	2.7	4.6	0.2	7.5
	2020	3.3	5.7	0.3	9.3	3.9	6.8	0.3	11.0
8	1980	6.0	10.4	0.5	16.9	6.5	11.3	0.6	18.4
	2000	9.6	16.6	0.8	27.0	11.0	18.9	0.9	30.8
	2020	15.3	26.3	1.2	42.8	17.7	30.5	1.3	49.5
9	1980	7.5	12.9	0.6	21.0	8.1	13.9	0.7	22.7
	2000	10.6	18.3	0.9	29.8	12.2	21.0	1.0	34.2
	2020	15.1	26.0	1.1	42.2	17.4	29.9	1.3	48.6
10	1980	14.4	24.9	1.2	40.5	15.6	27.0	1.3	43.9
	2000	23.0	39.6	1.8	64.4	26.1	45.0	2.1	73.2
	2020	36.3	62.4	2.7	101.4	42.1	72.6	3.2	117.9
LMR	1980	62.0	109.5	54.2	225.7	67.6	117.8	54.7	240.1
	2000	94.0	161.5	70.1	326.2	107.9	185.0	80.6	373.5
	2020	145.5	249.6	101.8	496.9	170.3	292.4	118.5	581.2

1/ WRPA 1 has no expressed need since there is assumed to be no population in that area.

Future fish and wildlife habitat needs will far exceed available resources in most parts of the region. Better management of the resources will help to reduce this disparity.

Hunters today make up a smaller portion of the regional population than they did in years past, but their absolute numbers have increased. They have more income and leisure time, and are exerting more pressure on the wildlife and waterfowl resource than ever before. Problems in meeting the needs of these sportsmen stem from continuing losses of wildlife habitat and from a general lack of access to areas providing such habitat for hunting. Statistics indicate that present waterfowl populations are using nearly all available habitat while the waterfowl population has been generally well below expected or target population. Some of the most productive wildlife lands in the region, the bottomland hardwoods, are being cleared at a rapid rate, and regional wildlife populations will eventually be reduced.

Those lands which are considered a part of the firm supply of productive wildlife habitat and public hunting lands are summarized in table 55. Firm supply is defined as that portion of the resource currently used for needs satisfaction and not likely to change status over the period of study.

Table 55 - Lands Dedicated to Wildlife Habitat, 1970, Lower Mississippi Region

WRPA	Firm Supply (1,000 Acres) Public[1/]	Private	Total
1	131	0	131
2	517	738	1,255
3	195	2,973	3,168
4	307	927	1,234
5	871	1,396	2,267
6	52	0	52
7	271	278	549
8	5	964	969
9	829	1,060	1,889
10	188	1,172	1,360
LMR	3,366	9,508	12,874

1/ Some 2 million acres of this total are primary use fish and wildlife lands.

Future Needs. Here again, as in the case of outdoor recreationists, a growing population of hunters with higher incomes and more leisure time will increase regional needs for huntable game and waterfowl. Table 56 provides a summary of the future wildlife habitat needs as shown in Appendix Q and as adjusted to a common management base for compatibility with other land uses. Future needs for wildlife habitat as shown in the Fish and Wildlife Appendix are based on an inefficiently managed resource. Therefore, the needs in this category, as in pastureland and forests, were adjusted to reflect an efficient level of management. Such adjustment resulted in a reduction in need of about 30 percent. However, even the adjusted habitat requirements reflect a need for 70 to 80 percent of the region's total land area by 2020. The magnitude of the needs poses an even greater problem when the mix of habitat types and needs are examined on a WRPA basis. For example, there is a regional habitat need in 2020 under Program B for 30,522,000

Table 56 - Future Wildlife Habitat Needs, Lower Mississippi Region

WRPA	Time Frame	Program A Appx Q (1,000 Acres)	Program A Adjusted (1,000 Acres)	Program B Appx Q (1,000 Acres)	Program B Adjusted (1,000 Acres)
2	1980	3,698	2,589	3,973	2,781
	2000	4,103	2,872	4,591	3,214
	2020	4,832	3,382	5,538	3,877
3	1980	8,380	5,866	9,198	6,469
	2000	11,416	7,991	12,987	9,091
	2020	15,609	10,926	18,109	12,676
4	1980	3,756	2,629	4,102	2,871
	2000	4,202	2,941	4,762	3,333
	2020	5,033	3,523	5,649	3,954
5	1980	5,070	3,549	5,390	3,773
	2000	5,986	4,190	6,786	4,750
	2020	7,348	5,144	8,363	5,854
6	1980	1,061	743	1,131	792
	2000	1,074	752	1,131	792
	2020	1,171	820	1,283	898
7	1980	964	675	1,060	742
	2000	1,099	769	1,278	895
	2020	1,321	925	1,543	1,080
8	1980	3,658	2,561	3,941	2,759
	2000	4,687	3,281	5,243	3,670
	2020	6,096	4,267	6,916	4,841
9	1980	4,503	3,152	5,818	3,373
	2000	5,091	3,564	5,767	4,037
	2020	5,972	4,180	6,709	4,696
10	1980	8,639	6,047	9,329	6,530
	2000	11,046	7,732	12,278	8,595
	2020	14,319	10,023	16,259	11,381
LMR	1980	39,729	27,811	42,942	30,059
	2000	48,704	34,092	54,823	38,376
	2020	61,701	43,190	70,369	49,258

acres of bottom-land hardwoods, nearly half of the region's area, or roughly three times the hardwoods which exist today. The 2020 Program B unadjusted need for habitat in WRPA 3, as another example, is 12,937,000 acres, which is nearly twice the total area in WRPA 3. The expressed need for bottom-land hardwoods habitat alone in this WRPA is over 7 million acres.

Mineral Lands

Present Status. In 1970, mineral production land in the region totaled 67,000 acres. About 40 percent of this acreage was used in connection with metallic and nonmetallic minerals production in WRPA 2, with much of the use in stone, sand, and gravel open-pit mining operations. An additional 20 percent of the total mineral production land was in WRPA 10, and was about evenly divided between production of oil and natural gas and nonmetallic minerals - primarily sulfur, salt, and construction materials. As shown in table 57, some land was used in all WRPA's for mineral production in 1970.

Measures need to be taken to restore topography and vegetation of strip mining lands. The lands above will be reclaimed by planting lespedeza and pine.

Table 57 - Mineral Land Use, 1970, Lower Mississippi Region

WRPA1/	2	3	4	5	6	7	8	9	10	LMR
Use (1,000 Ac.)	26	2	3	8	2	1	4	7	14	67

1/ Lands used in WRPA 1 are included in bordering WRPA's.

Future Needs. Needs for all mineral commodities are expected to increase dramatically over the next 50 years. The total value of production will double under Program A growth rates, and almost quadruple under Program B growth rates. Aggregate mineral land needs in 2020 are expected to be about 2.7 times present use under Program A and about 3.8 times present use for Program B. WRPA's 2, 10, and 9 will remain the major mineral producing areas in the region, collectively accounting for 80 percent of the total in 2020. Table 58 summarizes future land area needs for mineral production.

Table 58 - Future Mineral Land Needs, Lower Mississippi Region

	Need (1,000 Acres)					
	Program A			Program B		
WRPA	1980	2000	2020	1980	2000	2020
2	35	56	87	40	71	118
3	4	9	14	4	9	14
4	3	4	5	4	6	7
5	9	9	10	10	12	15
6	2	3	4	2	3	5
7	1	1	1	1	1	2
8	5	6	8	5	7	9
9	11	16	24	11	18	26
10	17	23	30	24	40	57
LMR	87	127	183	101	167	253

Environmental Quality Lands

Present Status and Needs. There are 12,283,000 acres of rural land in the region known to possess special environmental quality attributes. These lands are composed of near-wilderness areas, wetlands, unique geological features, unique botanical areas, unique ecological systems, beaches and shores, bottom-land hardwood forests, and lands bordering scenic lakes, river, and streams as itemized below:

Component	Acres
Near-Wilderness	659,000
Wetlands	1,030,000
Unique geological systems	850,000
Unique ecological systems	174,000
Beaches and shores	176,000
Bottom-land hardwood forests	10,851,000
Lands bordering scenic lakes and streams	144,000

Some of these acreage totals fall within more than one category of environmental quality needs and are therefore double counted. The double counting is identified in the gross need column in table 59. Only 7,316,000 acres of the environmentally significant rural lands are expected to remain in their present status during the entire study period. These are summarized as available supply in table 59. This means that special treatment will be required to preserve the remaining 4,967,000 acres (net needs) as an inheritance for future generations.

In addition to the rural lands, there are 13,000 acres of environmentally significant open and green space in urban areas. These need to be maintained and an additional 108,000 acres of open and green space needs to be created in urban areas.

Table 59 - Summary of Land Areas Needed for Environmental Quality Purposes, Lower Mississippi Region

Planning Area & Land Classification	Gross Needs (1,000 Acres) 1/									
					Unique Systems			Other Areas		
	Scenic Rivers	Lakes	Wilderness Areas	Wetlands	Botanical	Geological	Ecological	Wooded	Open	Total
WRPA 1										
Bottomland Hardwood Forest	-	6	-	-	-	-	-	873	-	879
WRPA 2										
Bottomland Hardwood Forest	18	1	24 2/	-	-	(91) 3/	120	965	-	1,128
Other Forest	-	-	20 4/	-	-	330 4/	-	-	-	350
Pasture	-	-	-	-	-	157 4/	1	-	-	158
Urban	-	-	-	-	-	-	-	-	8	8
Total	18	1	44	-	-	487	121	965	8	1,644
WRPA 3										
Bottomland Hardwood Forest	28	1	-	64	-	-	-	703	-	796
Urban	-	-	-	-	-	-	-	-	34	34
Total	28	1	-	64	-	-	-	703	34	830
WRPA 4										
Bottomland Hardwood Forest	-	2	5	-	-	-	10	1,131	-	1,148
Other Forest	-	-	-	-	-	1	-	-	-	1
Urban	-	-	-	-	-	-	-	-	8	8
Total	-	2	5	-	-	1	10	1,131	8	1,157
WRPA 5										
Bottomland Hardwood Forest	28	1	15	-	-	2	20	2,296	-	2,362
Other Forest	-	-	10	-	-	20	-	-	-	30
Urban	-	-	-	-	-	-	-	-	13	13
Total	28	1	25	-	-	22	20	2,296	13	2,405
WRPA 6										
Bottomland Hardwood Forest	-	1	-	-	-	-	-	755	-	756
Urban	-	-	-	-	-	-	-	-	2	2
Miscellaneous	-	-	-	-	5/	-	-	-	-	5/
Total	-	1	-	-	5/	-	-	755	2	758
WRPA 7										
Bottomland Hardwood Forest	13	1	20	-	-	-	3	462	-	499
Other Forest	-	-	10	-	-	-	-	-	-	10
Urban	-	-	-	-	-	-	-	-	1	1
Miscellaneous	-	-	-	-	-	1	-	-	-	1
Total	13	1	30	-	-	1	3	462	1	511
WRPA 8										
Bottomland Hardwood Forest	17	1	-	-	-	2	-	968	-	988
Other Forest	-	-	-	-	2	200	-	-	-	202
Pasture	-	-	-	-	-	1	-	-	-	1
Urban	-	-	-	-	-	-	-	-	12	12
Miscellaneous	-	-	-	-	5/	-	-	-	-	5/
Total	17	1	-	-	2	203	-	968	12	1,203
WRPA 9										
Bottomland Hardwood Forest	9	3	(555) 6/	966 7/	-	3	-	343	-	1,324
Other Forest	-	-	-	-	5/	-	-	-	-	5/
Urban	-	-	-	-	-	-	-	-	12	12
Miscellaneous	-	-	-	-	500	3	-	-	16	519
Total	9	3	(555)	966	500	6	-	343	28	1,855
WRPA 10										
Bottomland Hardwood Forest	4	4	-	-	-	-	-	962	-	970
Other Forest	-	-	-	-	1	-	-	-	-	1
Urban	-	-	-	-	-	-	-	-	31	31
Miscellaneous	-	-	-	-	-	5/	-	-	160	160
Total	4	4	-	-	1	5/	-	962	191	1,162
Region										
Bottomland Hardwood Forest	117	21	64	1,030	-	7	153	9,458	-	10,850
Other Forest	-	-	40	-	3	551	-	-	-	594
Pasture	-	-	-	-	-	158	1	-	-	159
Urban	-	-	-	-	-	-	-	-	121	121
Miscellaneous	-	-	-	-	500	4	-	-	176	680
Total	117	21	104	1,030	503	720	154	9,458	297	12,404

1/ 1980, 2000, and 2020 needs are identical.
2/ 20,000 acres qualify as ecological systems.
3/ Counted in ecological systems.
4/ Qualify as ecological systems.
5/ Less than 1,000 acres.
6/ Counted in wetlands
7/ 290,000 acres qualify as botanical systems.

Table 59 - Summary of Land Areas Needed for Environmental Quality Purposes, Lower Mississippi Region (Cont'd)

Planning Area & Land Classification	1970 Supply (1,000 Acres)									
	Scenic Rivers	Lakes	Wilderness Areas	Wetlands	Unique Systems: Botanical	Unique Systems: Geological	Unique Systems: Ecological	Other Areas: Wooded	Other Areas: Open	Total
WRPA 1										
Bottomland Hardwood Forest	-	0	-	-	-	-	-	0	-	0
WRPA 2										
Bottomland Hardwood Forest	0	0	9 4/	-	-	(41) 3/	54	67	-	130
Other Forest	-	-	0	-	-	155 4/	-	-	-	155
Pasture	-	-	-	-	-	0	-	-	-	0
Urban	-	-	-	-	-	-	-	-	7	7
Total	0	0	9	-	-	155	54	67	7	292
WRPA 3										
Bottomland Hardwood Forest	3	0	-	11	-	-	-	117	-	131
Urban	-	-	-	-	-	-	-	-	3	3
Total	3	0	-	11	-	-	-	117	3	134
WRPA 4										
Bottomland Hardwood Forest	-	0	0	-	-	-	0	947	-	947
Other Forest	-	-	-	-	-	0	-	-	-	0
Urban	-	-	-	-	-	-	-	-	0	0
Total	-	0	0	-	-	0	0	947	0	947
WRPA 5										
Bottomland Hardwood Forest	14	0	0	-	-	0	15	1,901	-	1,930
Other Forest	-	-	0	-	-	-	-	-	-	0
Urban	-	-	-	-	-	-	-	-	0	0
Total	14	0	0	-	-	0	15	1,901	0	1,930
WRPA 6										
Bottomland Hardwood Forest	-	0	-	-	-	-	-	609	-	609
Urban	-	-	-	-	-	-	-	-	0	0
Miscellaneous	-	-	-	-	5/	-	-	-	-	5/
Total	-	0	-	-	5/	-	-	609	0	609
WRPA 7										
Bottomland Hardwood Forest	0	0	0	-	-	-	0	407	-	407
Other Forest	-	-	0	-	-	-	-	-	-	0
Urban	-	-	-	-	-	-	-	-	0	0
Miscellaneous	-	-	-	-	-	0	-	-	-	0
Total	0	0	0	-	-	0	0	407	0	407
WRPA 8										
Bottomland Hardwood Forest	8	0	-	-	-	0	-	792	-	800
Other Forest	-	-	-	-	0	0	-	-	-	0
Pasture	-	-	-	-	-	0	-	-	-	0
Urban	-	-	-	-	-	-	-	-	1	1
Miscellaneous	-	-	-	-	5/	-	-	-	-	5/
Total	8	0	-	-	0	0	-	792	1	801
WRPA 9										
Bottomland Hardwood Forest	6	0	(453) 6/	753 8/	0	-	-	321	-	1,080
Other Forest	-	-	-	-	5/	-	-	-	-	5/
Urban	-	-	-	-	-	-	-	-	1	1
Miscellaneous	-	-	-	-	300	0	-	-	6	306
Total	6	0	(453)	753	300	0	-	321	7	1,387
WRPA 10										
Bottomland Hardwood Forest	4	0	-	-	-	-	-	776	-	780
Other Forest	-	-	-	-	0	-	-	-	-	0
Urban	-	-	-	-	-	-	-	-	1	1
Miscellaneous	-	-	-	-	-	5/	-	-	41	41
Total	4	0	-	-	0	5/	-	776	42	822
Region										
Bottomland Hardwood Forest	35	0	9	764	-	0	69	5,937	-	6,814
Other Forest	-	-	0	-	0	155	-	-	-	155
Pasture	-	-	-	-	-	0	0	-	-	0
Urban	-	-	-	-	-	-	-	-	13	13
Miscellaneous	-	-	-	-	300	0	-	-	47	347
Total	35	0	9	764	300	155	69	5,937	60	7,329

1/ through 7/ see page 126
8/ 333,000 acres qualify as botanical systems.

Table 59 - Summary of Land Areas Needed for Environmental Quality Purposes, Lower Mississippi Region (Cont'd)

Planning Area & Land Classification	Net Needs (1,000 Acres)									
					Unique Systems			Other Areas		
	Scenic Rivers	Lakes	Wilderness Areas	Wetlands	Botanical	Geological	Ecological	Wooded	Open	Total
WRPA 1										
Bottomland Hardwood Forest	-	6	-	-	-	-	-	873	-	879
WRPA 2										
Bottomland Hardwood Forest	18	1	15[9/]	-	-	(50)[3/]	66	898	-	998
Other Forest	-	-	20[1/]	-	-	175[4/]	-	-	-	195
Pasture	-	-	-	-	-	157[4/]	1	-	-	158
Urban	-	-	-	-	-	-	-	-	1	1
Total	18	1	35	-	-	332	67	898	1	1,352
WRPA 3										
Bottomland Hardwood Forest	25	1	-	53	-	-	-	586	-	665
Urban	-	-	-	-	-	-	-	-	31	31
Total	25	1	-	53	-	-	-	586	31	696
WRPA 4										
Bottomland Hardwood Forest	-	2	5	-	-	-	10	184	-	201
Other Forest	-	-	-	-	-	1	-	-	-	1
Urban	-	-	-	-	-	-	-	-	8	8
Total	-	2	5	-	-	1	10	184	8	210
WRPA 5										
Bottomland Hardwood Forest	14	1	15	-	-	2	5	395	-	432
Other Forest	-	-	10	-	-	20	-	-	-	30
Urban	-	-	-	-	-	-	-	-	13	13
Total	14	1	25	-	-	22	5	395	13	475
WRPA 6										
Bottomland Hardwood Forest	-	1	-	-	-	-	-	146	-	147
Urban	-	-	-	-	-	-	-	-	2	2
Miscellaneous	-	-	-	-	5/	-	-	-	-	5/
Total	-	1	-	-	5/	-	-	146	-	149
WRPA 7										
Bottomland Hardwood Forest	13	1	20	-	-	-	3	55	-	92
Other Forest	-	-	10	-	-	-	-	-	-	10
Urban	-	-	-	-	-	-	-	-	1	1
Miscellaneous	-	-	-	-	-	1	-	-	-	1
Total	13	1	30	-	-	1	3	55	1	104
WRPA 8										
Bottomland Hardwood Forest	9	1	-	-	-	2	-	176	-	188
Other Forest	-	-	-	-	2	200	-	-	-	202
Pasture	-	-	-	-	-	1	-	-	-	1
Urban	-	-	-	-	-	-	-	-	11	11
Miscellaneous	-	-	-	-	5/	-	-	-	-	5/
Total	9	1	-	-	2	203	-	176	11	402
WRPA 9										
Bottomland Hardwood Forest	3	3	(102)[6/]	213[10/]	-	3	-	22	-	244
Other Forest	-	-	-	-	5/	-	-	-	-	5/
Urban	-	-	-	-	-	-	-	-	11	11
Miscellaneous	-	-	-	-	200	3	-	-	10[11/]	213
Total	3	3	(102)	213	200	6	-	22	21	468
WRPA 10										
Bottomland Hardwood Forest	0	4	-	-	-	-	-	186	-	190
Other Forest	-	-	-	-	1	-	-	-	-	1
Urban	-	-	-	-	-	-	-	-	30	30
Miscellaneous	-	-	-	-	-	5/	-	-	119[11/]	119
Total	0	4	-	-	1	5/	-	186	149	340
Region										
Bottomland Hardwood Forest	80	30	55	266	-	7	84	3,514	-	4,036
Other Forest	-	-	40	-	3	396	-	-	-	439
Pasture	-	-	-	-	-	158	1	-	-	159
Urban	-	-	-	-	-	-	-	-	108	108
Miscellaneous	-	-	-	-	200	4	-	-	129	333
Total	80	30	95	266	203	565	85	3,514	237	5,075

1/ through 7/ see page 126.
8/ see page 127.
9/ 20,000 acres qualify as ecological systems.
10/ 31,000 acres qualify as botanical systems.
11/ Beaches and shores.

Most of the lands possessing special environmental quality attributes are found in bottomland hardwood forests such as this.

Summary of Land Needs

The region's land use configuration of 1970 and future needs for land by category and primary objective are recapitulated in table 60. Tables 61, 62, and 63 provide future needs information on a WRPA basis for each objective.

High priority land needs for food and fiber production and for transportation, urban and built-up purposes will exceed the land resource base of the region before the year 2000. The total 1980 Program A need of 62,092,000 acres for these land uses is only 379,000 acres less than the total land resource of the region. The 1980 Program B need is 63,893,000 acres, which makes for a resource deficiency of 1,422,000 acres. By the year 2020, these primary land use needs will have increased to 63,591,000 acres under Program A growth rates for a resource deficiency of 1,120,000 acres, or to a total of 69,150,000 acres under Program B projections for a resource deficiency of 6,679,000 acres. The Environmental Quality Program needs fall between those for Programs A and B, being closer to Program A.

Table 64 summarizes the total primary land needs for each objective on a WRPA basis. Exclusive use environmental quality component acreages are counted in the primary needs for that objective. On figure 7 is shown the relative differences between 1970 land use and 2020 land needs.

Table 60 - Summary of Land Use in 1970 and Future Land Needs, Lower Mississippi Region

		Land Use and Needs (1,000 Acres)			
		1970	Future Need (Adjusted)		
Category	Objective 1/	Use 2/	1980	2000	2020
Cropland	NI, EQ	17,343	19,203	20,374	21,075
	RD		19,203	21,890	22,596
Pastured Cropland	NI, EQ	2,871	5,054	5,434	5,778
	RD		5,054	5,830	6,200
Permanent Pasture	NI, EQ	6,782	6,962	7,553	8,086
	RD		6,962	8,097	8,682
Pastured Forests 3/	NI, EQ	4,207 3/	5,993 3/	6,560 3/	7,033 3/
	RD		5,993	7,030	7,542
Other 4/	NI, EQ	3,506	3,915	3,718	3,478
	RD		3,915	3,718	3,478
Forestland	NI, EQ	29,637	24,477	23,025	21,621
	RD		26,110	25,539	24,105
Transportation, Urban & Built-up	NI, EQ	2,332	2,481	2,898	3,553
	RD		2,649	3,277	4,089
Total	NI, EQ	62,471 5/	62,092	63,002	63,591
	RD		63,893	67,955	69,150
Recreation	NI, EQ	99	226	326	497
	RD		240	374	581
Fish & Wildlife	NI, EQ	12,874 6/	27,811	34,092	43,190
	RD		30,059	38,376	49,258
Minerals	NI, EQ	67	87	127	183
	RD		101	167	253
Fish Farming	NI, EQ	46	70	117	164
	RD		70	117	164
Environmental	NI, EQ, RD	-	12,404	12,404	12,404

1/ NI-National Income; RD-Regional Development; EQ-Environmental Quality.
2/ The study's base definition of land use is that presented in Appendix F, Land Resources, which contains only the first seven categories listed below plus large and small water areas. These categories collectively account for the entire aerial extent of the region. This does not mean that other listed categories of land use are not also primary users of the region's lands now or that they will discontinue being primary users in the future.
3/ Included in Forestland acreage.
4/ Includes 2,052,000 acres of marshlands in WRPA's 9 and 10.
5/ An additional 3,067,000 acres of the region are in water areas.
6/ 2,021,394 acres of this total were primary use fish and wildlife lands in 1970.

Table 61 - Summary of Future Land Needs, National Income Objective, Lower Mississippi Region

		(1,000 Acres)										
		Food and Fiber						Other				
WRPA	Time	Cropland	Other Agricultural	Pastured Cropland	Pastured Forests 1/	Permanent Pasture	Forestland	Transportation Urban & Built-up	Commercial Fish Farming	Recreation	Wildlife	Minerals
1	1980	188	62	30	135	32	879	0	0	0 2/	0 2/	0 3/
	2000	188	62	30	135	32	879	0	0	0	0	0
	2020	188	62	30	135	32	879	0	0	0	0	0
2	1980	7,201	379	501	447	314	1,781	378	21	23	2,589	35
	2000	7,618	253	504	454	319	1,193	396	30	24	2,872	56
	2020	7,761	174	514	464	326	957	459	40	34	3,382	87
3	1980	2,094	392	1,117	464	501	1,721	401	1	39	5,866	4
	2000	2,170	379	1,219	512	551	1,423	536	2	66	7,991	9
	2020	2,346	354	1,314	551	583	1,019	724	3	109	10,926	14
4	1980	3,545	253	578	1,073	1,819	2,337	335	20	36	2,629	3
	2000	4,274	230	690	1,284	2,070	1,880	361	37	46	2,941	4
	2020	4,457	163	760	1,428	2,279	1,431	426	54	67	3,523	5
5	1980	592	202	559	1,048	856	10,069	458	6	40	3,549	9
	2000	560	180	582	1,090	881	10,779	532	12	56	4,190	9
	2020	569	137	608	1,140	921	10,956	647	18	84	5,144	10
6	1980	2,225	95	199	224	468	994	79	4	5	743	2
	2000	2,374	102	208	234	489	905	79	9	6	752	3
	2020	2,637	115	219	246	515	881	80	14	8	820	4
7	1980	197	68	315	1,251	1,018	1,940	121	1	4	675	1
	2000	147	49	356	1,427	1,161	1,848	136	3	6	769	1
	2020	104	12	392	1,565	1,278	1,797	151	4	9	925	1
8	1980	217	59	349	615	587	2,170	206	1	17	2,561	5
	2000	170	47	367	651	616	2,176	260	1	27	3,281	6
	2020	193	21	391	688	650	2,226	333	2	43	4,267	8
9	1980	2,673	734	1,316	677	1,072	1,846	243	14	21	3,152	11
	2000	2,623	752	1,383	711	1,126	1,405	271	20	30	3,564	16
	2020	2,578	787	1,450	751	1,178	1,018	314	26	42	4,180	24
10	1980	271	1,671	90	59	295	740	260	2	41	6,047	17
	2000	250	1,664	95	62	308	537	327	3	64	7,732	23
	2020	242	1,653	100	65	324	457	419	3	101	10,023	30
LMR	1980	19,203	3,915	5,054	5,993	6,962	24,477	2,481	70	226	27,811	87
	2000	20,374	3,718	5,434	6,560	7,553	23,025	2,898	117	326	34,092	127
	2020	21,075	3,478	5,778	7,033	8,086	21,621	3,553	164	497	43,190	183

1/ Included in Forestland.
2/ No needs are generated within WRPA 1 but the WRPA satisfies needs in other areas.
3/ Included in adjoining WRPA's.

Table 62 - Summary of Future Land Needs, Regional Development Objective, Lower Mississippi Region

		(1,000 Acres)											
		Food and Fiber						Other					
WRPA	Time	Cropland	Other Agricultural	Pastured Cropland	Pastured Forests	Permanent Pasture	Forestland	Transportation, Urban & Built-up	Commercial Fish Farming	Recreation	Wildlife	Minerals	
1	1980	188	62	30	135	32	879	0	0	0 2/	0 2/	0 3/	
	2000	188	62	30	135	32	879	0	0	0	0	0	
	2020	188	62	30	135	32	879	0	0	0	0	0	
2	1980	7,201	379	501	447	314	1,878	392	21	23	2,781	40	
	2000	8,142	253	534	482	339	1,324	448	30	27	3,214	71	
	2020	8,216	174	552	498	350	1,081	541	40	40	3,877	118	
3	1980	2,094	392	1,117	464	501	1,892	439	1	43	6,439	4	
	2000	2,285	379	1,310	549	581	1,593	612	2	76	9,091	9	
	2020	2,459	354	1,411	592	626	1,152	843	3	130	12,676	14	
4	1980	3,545	253	578	1,073	1,819	2,522	357	20	37	2,871	4	
	2000	4,662	230	742	1,379	2,224	2,106	408	37	53	3,333	6	
	2020	4,904	163	816	1,533	2,448	1,616	485	54	77	3,954	7	
5	1980	592	202	559	1,048	856	10,668	487	6	42	3,773	10	
	2000	625	180	625	1,171	946	11,965	605	12	65	4,750	12	
	2020	626	137	653	1,224	989	12,161	736	18	97	5,854	15	
6	1980	2,225	95	199	224	468	1,024	79	4	5	792	2	
	2000	2,566	102	224	252	526	959	82	9	7	792	3	
	2020	2,778	115	235	264	553	952	88	14	9	898	5	
7	1980	197	68	315	1,251	1,018	2,133	133	1	5	742	1	
	2000	170	49	382	1,533	1,247	2,106	158	3	8	895	1	
	2020	130	12	420	1,681	1,372	2,102	188	4	11	1,080	2	
8	1980	217	59	349	615	587	2,342	222	1	18	2,759	5	
	2000	204	47	395	699	661	2,461	292	1	31	3,670	7	
	2020	216	21	429	739	698	2,515	380	2	50	4,841	9	
9	1980	2,673	734	1,316	677	1,072	1,973	260	14	23	3,373	11	
	2000	2,772	752	1,486	764	1,210	1,545	307	20	34	4,037	18	
	2020	2,814	787	1,556	806	1,265	1,130	352	26	49	4,696	26	
10	1980	271	1,671	90	59	295	799	280	2	44	6,530	24	
	2000	276	1,664	102	66	331	601	365	3	73	8,595	40	
	2020	265	1,653	107	70	349	517	476	3	118	11,381	57	
LMR	1980	19,203	3,915	5,054	5,993	6,962	26,110	2,649	70	240	30,059	101	
	2000	21,890	3,718	5,830	7,030	8,097	25,539	3,277	117	374	38,376	167	
	2020	22,596	3,478	6,200	7,542	8,682	24,105	4,089	164	581	49,258	253	

1/ Included in forestland.
2/ No need is generated within WRPA 1, but the WRPA satisfies needs in adjacent areas.
3/ Included in adjoining WRPA's.

Table 63 - Summary of Future Land Needs, Environmental Quality Objective, Lower Mississippi Region

WRPA/Time		Environmental Quality (1,000 Acres) Urban	Permanent Pasture	Forests	Other	Total EQ Lands	EQ Exclusive Use
1	1980	0	0	879	0	879	0
	2000	0	0	879	0	879	0
	2020	0	0	879	0	879	0
2	1980	8	158(1)1/	1,478(120)	0	1,644	121
	2000	8	158(1)	1,478(120)	0	1,644	121
	2020	8	158(1)	1,478(120)	0	1,644	121
3	1980	34	0	796(1)	0	830	1
	2000	34	0	796(1)	0	830	1
	2020	34	0	796(1)	0	830	1
4	1980	8	0	1,149(15)	0	1,157	15
	2000	8	0	1,149(15)	0	1,157	15
	2020	8	0	1,149(15)	0	1,157	15
5	1980	13	0	2,392(30)	0	2,405	30
	2000	13	0	2,392(30)	0	2,405	30
	2020	13	0	2,392(30)	0	2,405	30
6	1980	2	0	756	0	758	0
	2000	2	0	756	0	758	0
	2020	2	0	756	0	758	0
7	1980	1	0	509(30)	1(1)	511	31
	2000	1	0	509(30)	1(1)	511	31
	2020	1	0	509(30)	1(1)	511	31
8	1980	12	1(1)	1,190(2)	0	1,203	3
	2000	12	1(1)	1,190(2)	0	1,203	3
	2020	12	1(1)	1,190(2)	0	1,203	3
9	1980	12	0	1,324(555)	519 2/	1,855	555 2/
	2000	12	0	1,324(555)	519 2/	1,855	555 2/
	2020	12	0	1,324(555)	519 2/	1,855	555 2/
10	1980	31	0	971(1)	160	1,162	1
	2000	31	0	971(1)	160	1,162	1
	2020	31	0	971(1)	160	1,162	1
LMR	1980	121	159(2)	11,444(754)	680(1) 2/	12,404	757
	2000	121	159(2)	11,444(754)	680(1) 2/	12,404	757
	2020	121	159(2)	11,444(754)	680(1) 2/	12,404	757

Table 63 - Summary of Future Land Needs, Environmental Quality Objective, Lower Mississippi Region (Cont'd)

WRPA/Time		Food and Fiber (1,000 Acres) Cropland	Other Agricultural	Pastured Cropland	Pastured Forests3/	Permanent Pasture	Forestland
1	1980	188	62	30	135	32	879
	2000	188	62	30	135	32	879
	2020	188	62	30	135	32	879
2	1980	7,201	379	501	447	314	1,781
	2000	7,618	253	504	454	319	1,193
	2020	7,761	174	514	464	326	957
3	1980	2,094	392	1,117	464	501	1,721
	2000	2,170	379	1,219	512	551	1,423
	2020	2,346	354	1,314	551	585	1,019
4	1980	3,545	253	578	1,073	1,819	2,337
	2000	4,274	230	690	1,284	2,070	1,880
	2020	4,457	163	760	1,428	2,279	1,431
5	1980	592	202	559	1,048	856	10,069
	2000	560	180	582	1,090	881	10,779
	2020	569	137	608	1,140	921	10,956
6	1980	2,225	95	199	224	468	994
	2000	2,374	102	208	234	489	905
	2020	2,637	115	219	246	515	881
7	1980	197	68	315	1,251	1,018	1,940
	2000	147	49	356	1,427	1,161	1,848
	2020	104	12	392	1,565	1,278	1,797
8	1980	217	59	349	615	587	2,170
	2000	170	47	367	651	616	2,176
	2020	193	21	391	688	650	2,226
9	1980	2,673	734	1,316	677	1,072	1,846
	2000	2,623	752	1,383	711	1,126	1,405
	2020	2,578	787	1,450	751	1,178	1,018
10	1980	271	1,671	90	59	295	740
	2000	250	1,664	95	62	308	537
	2020	242	1,653	100	65	324	457
LMR	1980	19,203	3,915	5,054	5,993	6,962	22,499
	2000	20,374	3,718	5,434	6,560	7,553	23,025
	2020	21,075	3,478	5,778	7,033	8,086	21,621

Table 63 - Summary of Future Land Needs, Environmental Quality Objective, Lower Mississippi Region (Cont'd)

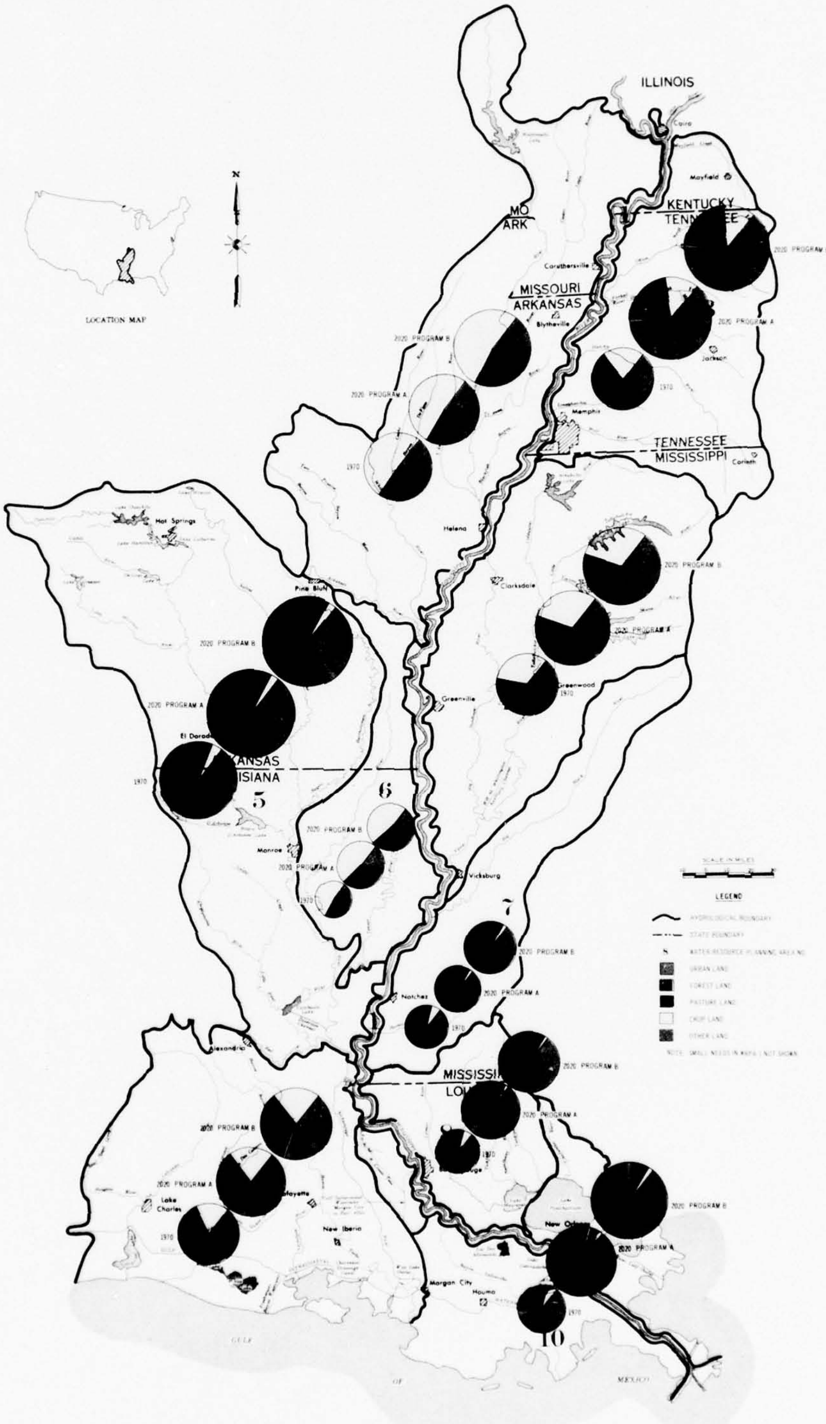
WRPA/Time		Other (1,000 Acres) Transportation, Urban & Built-up	Commercial Fish Farming	Recreation	Wildlife	Minerals
1	1980	0	0	0 4/	0 4/	0 5/
	2000	0	0	0	0	0
	2020	0	0	0	0	0
2	1980	378	21	23	2,589	35
	2000	396	30	24	2,872	56
	2020	459	40	34	3,382	87
3	1980	401	1	39	5,866	4
	2000	536	2	66	7,991	9
	2020	724	3	109	10,926	14
4	1980	335	20	36	2,629	3
	2000	361	37	46	2,941	4
	2020	426	54	67	3,523	5
5	1980	458	6	40	3,549	9
	2000	532	12	56	4,190	9
	2020	647	18	84	5,144	10
6	1980	79	4	5	743	2
	2000	79	9	6	752	3
	2020	80	14	8	820	4
7	1980	121	1	4	675	1
	2000	136	3	6	769	1
	2020	151	4	9	925	1
8	1980	206	1	17	2,561	5
	2000	260	1	27	3,281	6
	2020	333	2	43	4,267	8
9	1980	243	14	21	3,152	11
	2000	271	20	30	3,564	16
	2020	134	26	42	4,180	24
10	1980	260	2	41	6,047	17
	2000	327	3	64	7,732	23
	2020	419	3	101	10,023	30
LMR	1980	2,481	70	226	27,811	87
	2000	2,898	117	326	34,092	127
	2020	3,553	164	497	43,190	183

1/ Parenthesis (I) denote exclusive use.
2/ 500,000 acres are unforestable marshland and are included in primary land use "other."
3/ Included in Forestland.
4/ No need is generated within WRPA 1 but the WRPA satisfies needs in adjacent areas.
5/ Included in adjoining WRPA's.

Table 64 - Comparison of Selected Land Needs and the Land Base, Lower Mississippi Region

WRPA	Time Frame	Actual Land Area (1,000 Acres)	Total Needs NI 1/ Program	RD 1/ Program (1,000 Acres)	EQ 2/ Program
1	1980	1,191	1,191	1,191	1,191
	2000		1,191	1,191	1,191
	2020		1,191	1,191	1,191
2	1980	10,513	10,554	10,665	10,675
	2000		10,283	11,040	10,404
	2020		10,191	10,914	10,312
3	1980	6,746	6,226	6,435	6,227
	2000		6,278	6,760	6,279
	2020		6,752	6,845	6,753
4	1980	8,340	8,867	9 074	8,882
	2000		9,505	10,372	9,520
	2020		9,516	10,432	9,531
5	1980	12,813	12,736	13,364	12,766
	2000		13,514	14,946	13,544
	2020		13,838	15,302	13,868
6	1980	3,461	4,060	4,090	4,060
	2000		4,157	4,459	4,157
	2020		4,447	4,721	4,447
7	1980	4,113	3,659	3,864	3,690
	2000		3,697	4,112	3,728
	2020		3,734	4,224	3,765
8	1980	3,533	3,588	3,776	3,591
	2000		3,636	4,060	3,639
	2020		3,814	4,250	3,817
9	1980	7,972	7,884	8,028	8,439
	2000		7,560	8,072	8,115
	2020		7,325	7,904	7,880
10	1980	3,789	3,327	3,406	3,328
	2000		3,181	3,339	3,182
	2020		3,195	3,367	3,195
LMR	1980	62,471	62,092	63,893	62,849
	2000		63,002	68,351	63,759
	2020		63,591	69,150	64,348

1/ Needs for cropland; pasture; forests; other agriculture; and transportation, urban and built-up.
2/ Includes categories in footnote 1, plus lands needed for environmental quality components.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

PRESENT USE AND
PROJECTED NEED FOR LAND

FIGURE 7

Related Problems

Flood Damage

General. The socioeconomic environment implicit in the preceding expression of resource needs is one relatively safe for human habitation and increased economic growth. Vital ingredients of that environment are measures to control floods - the most frequent natural catastrophe to be visited upon this region.

The frequency and severity of flooding are somewhat easier to understand when the following facts are considered:

1. The region is the major outlet for drainage of 41 percent of the 48 contiguous States of the United States and parts of two Canadian provinces. All of the runoff from major river basins, such as the Missouri and Upper Mississippi, the Ohio including the Tennessee and others, and the Arkansas, White, and Red Rivers, flows into the Lower Mississippi Region.

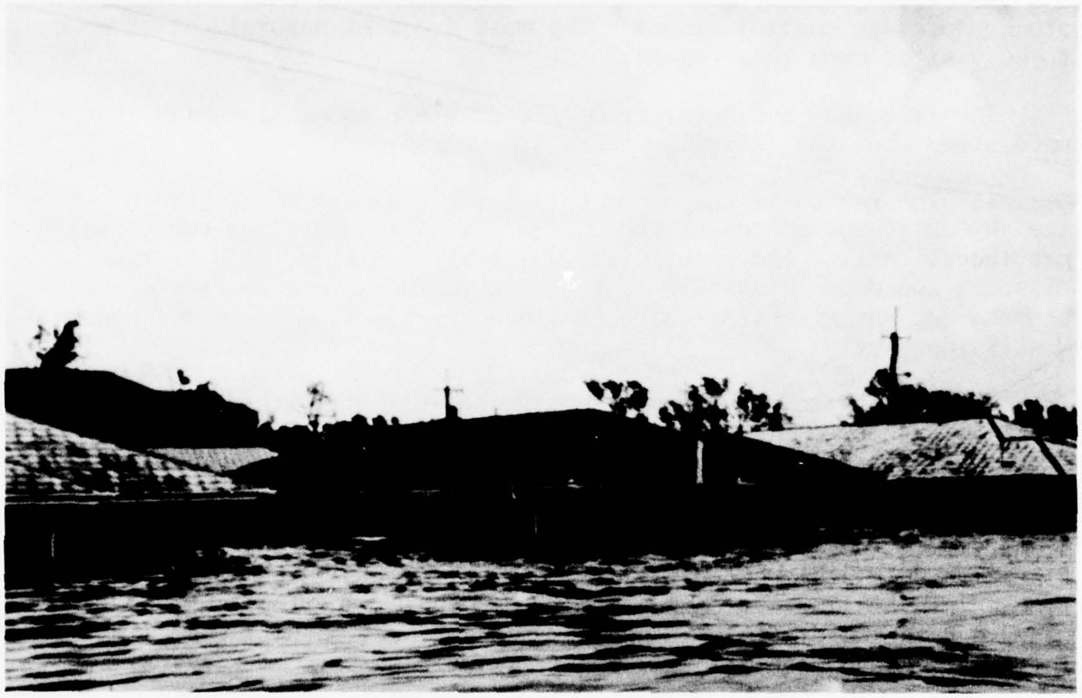
2. The region has a humid subtropical climate with an average of about 52 inches of precipitation per year. Intense rainfall often occurs during short periods.

3. About one-half of the region's land is in flood plain areas, primarily in the Mississippi River alluvial valley, which is relatively flat with only a slight gulfward slope. The soils which make up this flood plain are largely composed of impermeable materials such as fatty clays and the water table is near ground surface, resulting in limited infiltration and high rainfall-runoff relationships.

Devastating floods resulting in the evacuation and displacement of thousands of people, hundreds of millions in dollar damages to homes and public, commercial, and industrial developments, and severe losses to the region's farmers have occurred several times in this century. The most recent flood reached its peak in 1973, with continuing high water into 1974. It was not as great as the record flood of 1927, but it caused nearly $760 million in damages, made thousands homeless for an extended period, and accounted for 28 deaths. Its overall impact on the national economy is difficult to quantify precisely, but in a period of food shortages and rising prices the flood losses had a significant adverse economic effect.

The region's main line of defense against such disasters is the Mississippi River and Tributaries (MR&T) Project, presently less than 50 percent complete. The tremendous dollar damages and human suffering experienced in 1973 would have been magnified nearly 18 times without the Project, which prevented nearly $13 billion in damages. No estimate of lives saved in 1973 can be made, but the project's worth in this regard is implicit in that seven times as many people perished during the flood which occurred in the absence of the Project in 1927. Table 65

provides a summary of losses due to the 1973 flood and an estimate of what the losses would have been without existing flood control. The table clearly shows that nearly all regional damages prevented were attributable to the MR&T Project.



Tidal flooding in WRPA 10 resulting from Hurricane Betsy in 1965.

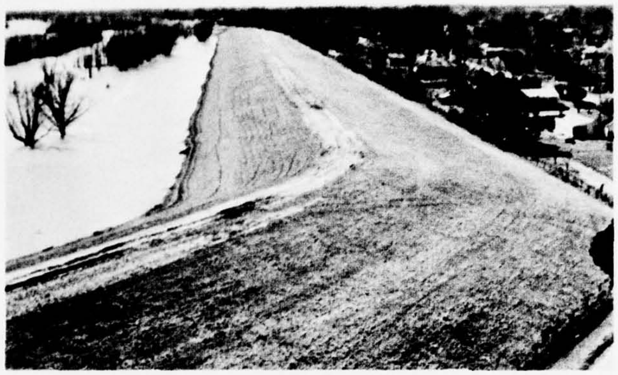
Present Status. Flood control works considered to be in place in the region include 3,780 miles of levees and floodwalls, 11,555 miles of channel improvements, 37 pumping plants, numerous large and small reservoirs with a combined flood storage capacity of more than 6 million acre-feet, four hurricane protection projects, and a vigorous nonstructural program which includes 55 flood plain information reports either completed or underway, localized flood hazard data, floodway evaluations, and land treatment applied to more than 19 million acres of rural lands. The non-structural program further includes flood forecasting services of the National Weather Service, with a forecast center at Slidell, Louisiana and District Offices at six locations, provides a river and flood forecast service for the entire region. Hurricane storm surge, and storm tide forecasts for the coastal section are provided by the New Orleans Weather Service Forecast Center.

Because of the study's adopted definition of completed works - "developments completed, under construction, or funded for construction as of Fiscal Year 1973" - the four major hurricane protection projects

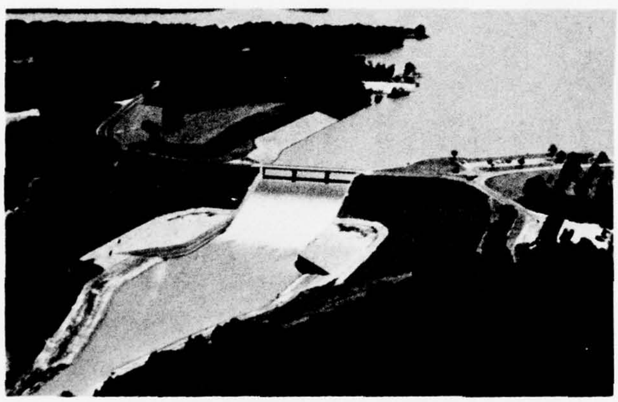
Table 65 - Damage Appraisal - 1973 Flood, Lower Mississippi Region

	Estimated Damages ($1,000) 1/		
Damage Category	With Existing Projects	Without Projects	Prevented by Projects
Agricultural			
Crop	326,138	1,135,911	809,773
Livestock	6,848	31,425	24,577
Buildings, equipment, & supplies	21,845	68,004	46,159
Other (farm roads, fences, drainage, etc.)	40,333	111,498	71,165
Urban			
Property - private			
Residential	33,346	3,211,276	3,177,930
Commercial	9,805	1,831,700	1,821,895
Property - public	2,310	592,715	590,405
Utilities	9,342	270,173	260,831
Business losses	161,878	4,742,822	4,580,944
Other	15,287	1,315,000	1,299,713
Rerouting of traffic	18,563	161,437	142,874
Evacuation, dislocation, & rehabilitation	21,249	214,693	193,444
Roads, bridges, utilities, etc.	16,184	141,326	125,142
Flood fighting	40,033	99,990	59,957
Federal property	34,867	29,794	-5,073
Total for Region	758,028	13,957,764	13,199,736
Total for MR&T Project only	724,600	13,517,500	12,792,900

1/ Navigation damages not included.



The extensive system of levees along the Lower Mississippi River protects thousands of acres of agricultural, industrial, and urban lands.



Floodwater being discharged over the spillway of Enid Reservoir (WRPA 4) during 1973 flood.

The Bonnet Carrê floodway protects the city of New Orleans and delta area below by diverting floodwater from the Mississippi River to Lake Pontchartrain whenever the flow in the river exceeds the safe capacity of the leveed river channel.

and a substantial portion of the MR&T Project were considered in place. In fact, these flood control projects are far from complete, with scheduled completion dates running to 1985 and, in some instances, beyond that date. A large backlog of construction on these projects must be overcome before the scope and degree of protection assumed as a base condition for assessment of both current and future flood damages will actually exist. Because of the complexity of these long-range continuing projects and their importance to the region, further elaboration is warranted.

The MR&T Project can be divided into three major elements: (1) the Mississippi River levee system including the Mississippi River levees and floodways, (2) Mississippi River channel improvement, and (3) tributary works.

The Mississippi River levee system and floodways element includes more than 2,200 miles of levees and floodwalls including the Birds Point-New Madrid, Atchafalaya, Morganza, and Bonnet Carré floodway levees. All floodways are operational, though considerable construction remains, especially in the Atchafalaya floodway, to insure sufficient flow-carrying capacity. All except 28.3 miles of the levees and floodwalls are in place, but various reaches of levee totaling over 800 miles are considerably below full grade and section. The levee and floodwall system is comprised of about 1,518 miles of main levees. This includes levees in the lower reaches of the Yazoo River. It also includes 7 miles of floodwalls along the Mississippi River. There are an additional 671 miles of levees and floodwalls along the various floodways and along the lower reaches of the Arkansas and Red Rivers. Floodway levees serve to contain diverted flows within a specified channel when excess floodwaters are diverted past critical reaches of the Mississippi River. The Arkansas and Red River levees and the Yazoo basin levees protect landward areas against Mississippi River backwater.

The entire levee system of the MR&T Project was considered complete in the flood damage assessment although design protection is not yet provided. Thus, there is no protection against the Project Design Flood or equivalent events, and the potential for flood losses is far greater than that reflected in the damage assessment. The critical importance of completing this feature of the MR&T Project is recognized in the flood control plans.

The channel improvement feature serves several important functions. It helps maintain the alignment and flood carrying capacity of the river channel and further helps protect the levee system. It also provides a navigable channel for the Nation's busiest inland waterway. Construction and maintenance work consists of concrete revetments, dikes, cut-offs, and dredging at various locations along approximately 954 miles of

channel. As in the case of the levees, this element was assumed to be complete. In reality, the existing channel dimensions and alignment are less than required to fulfill project objectives. Until this feature and the levee portion of the MR&T Project are completed, the flood situation in the Valley must be considered critical.

The third major element in the MR&T Project consists of works in basins tributary to the Mississippi River. Authorized works in the tributary feature include 1,666 miles of levees, 4,947 miles of channels, 25 major pumping plants with a total capacity of 30,087 c.f.s. (including the 12,000 c.f.s. W. G. Huxtable Pumping Plant, one of the world's largest, now under construction in the St. Francis Basin in WRPA 2), and five major reservoirs with total flood control storage of 4,391,800 acre-feet. As of 1973 there were 2,775 miles of channel improvement, 1,135 miles of levees, and 18 pumping plants with a total pumping capacity of 19,107 c.f.s. completed or nearing completion. All authorized MR&T reservoirs are complete. Tributary works in the MR&T Project yet to be constructed consist of 2,172 miles of channel improvement, 531 miles of levees, and seven pumping plants with a total capacity of 10,980 c.f.s. The tributary features are as important to the individual basins as the main stem features are to the Lower Mississippi Valley. Most damages associated with remaining tributary flood control works are reflected in the damage assessment.

Hurricane protection projects, major non-MR&T reservoirs, and many local protection projects make up the remainder of the existing flood control works in the region and consist of a total of 450 miles of levees, 7,826 (excluding Mississippi River) miles of improved channel (mostly PL 566 projects), 19 pumping plants with a total capacity of 8,516 c.f.s., and numerous small floodwater retarding structures having a total storage of 664,100 acre-feet.

Four major hurricane protection projects in the coastal area are designed to protect densely populated areas in the southern portion of the region, including the intensely developed areas of metropolitan New Orleans, Morgan City, Larose to Golden Meadow, Louisiana, and urban areas in the lower delta below New Orleans to Venice, Louisiana, from tidal and hurricane induced flooding. These projects though technically complete if the study definition of existing projects is literally applied, are far from complete; and those components actually in place at this time provide protection to only a small part of the total area to be protected upon their completion. This means that the assessed damages in the coastal planning areas (particularly in WRPA 10) are understated in terms of the damage potential that actually exists.

In upstream watersheds many PL 566 projects which are assumed to be in place in the damage assessment have not been completed. This makes the stated upstream watershed damages considerably less than the true damage potential.

The major non-MR&T tributary basin projects were assumed to be in a condition of completion which very nearly approximates actual conditions. Therefore, the assessments of "headwater" damage potential on principal reaches in those areas are realistic for both present and future conditions. Included in this category are three existing major reservoirs which provide flood relief on the Ouachita, Caddo, and Little Missouri Rivers in the Ouachita Basin. These reservoirs collectively have the potential to store 972,400 acre-feet of floodwater.

Many local protection projects consisting of levees, channel improvements, pumping plants, and small flood-water retarding structures have also been constructed over the years. These projects, though individually limited in size and scope, nonetheless play an important role in the safety of the region's inhabitants and in the protection of the region's economic structure.

Much has been and is being accomplished in the field of flood control and other forms of flood plain management. Yet, much remains to be done. About half of the total land area in the region is subject to flooding and experiences about $212 million average annual flood damages; about 67 percent of that damage potential is agricultural, about 19 percent is urban, and the remainder is in all other categories of flood damage. Most of the damage (about 85 percent) is the result of headwater flooding on major tributary streams and in upstream watersheds. Tidal flooding in the coastal area constitutes the source of about 58 percent of the urban damages in the region.

WRPA 10, which contains the metropolitan New Orleans area, has by far the greatest urban flood damage potential in the region, primarily due to susceptibility to hurricane-induced tidal flooding. WRPA 3, which contains Memphis, Tennessee, has the second largest urban damage potential, most of which is due to headwater floods on principal streams in the area. Table 66 provides a summary of remaining flood problems in the region.

Future Damages

In the agricultural areas, average annual flood damages estimated on the basis of 1970 conditions are $144 million. Projected to the year 2020, these damages are $250 million based on the national income economic growth rates and $262 million based on regional development growth rates. The increase is due largely to expected future gains in crop yields and, to a lesser extent, the expected placement of additional acres of flood plain lands into agricultural production.

Urban and built-up average annual damages - estimated at $40 million in 1970 - are projected to $152 million in 2020 with national income growth rates or $160 million with regional development economic growth. The increases are indicative of expected growth in urban development combined with expected upward trends in the value of damageable assets in the susceptible area.

Table 66- Remaining Flood Problems, 1970 Conditions, Lower Mississippi Region

WRPA	Area Subject to Floods (1,000 Acres)		Average Annual Damages Due To Flooding ($1,000)											
			Principal Streams				Upstream Watersheds				Total			
	Principal Streams	Upstream Watersheds	Agri.	Urban & Built-Up	Other	Total	Agri.	Urban & Built-Up	Other	Total	Agri.	Urban & Built Up	Other	Total
1														
Headwater	1,190	-	2,800	20	416	3,236	-	-	-	-	2,800	20	416	3,236
Backwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2														
Headwater	4,858	2,616	20,129	1,402	3,873	25,404	29,232	140	4,330	33,702	49,361	1,542	8,203	59,106
Backwater	861	-	455	-	80	535	-	-	-	-	455	-	80	535
3														
Headwater	1,173	828	4,610	6,973	552	12,135	5,444	1,262	1,776	8,482	10,054	8,235	2,328	20,617
Backwater	274	-	306	95	40	441	-	-	-	-	306	95	40	441
4														
Headwater	2,048	1,877	9,220	1,105	4,617	14,942	17,506	1	1,910	19,417	26,726	1,106	6,527	34,359
Backwater	724	-	1,579	260	216	2,055	-	-	-	-	1,579	260	216	2,055
5														
Headwater	1,481	2,667	2,622	994	1,854	5,470	11,534	115	1,495	13,144	14,156	1,109	3,349	18,614
Backwater	557	-	1,270	48	341	1,659	-	-	-	-	1,270	48	341	1,659
6														
Headwater	1,033	2,425	2,794	68	674	3,536	13,854	21	582	14,457	16,648	89	1,256	17,993
Backwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7														
Headwater	290	487	442	1,091	150	1,683	2,427	13	710	3,150	2,869	1,104	860	4,833
Backwater	81	-	239	118	266	623	-	-	-	-	239	118	266	623
8														
Haadwater	1,017	1,029	142	847	7	996	2,967	808	541	4,316	3,109	1,655	548	5,312
Backwater	61	-	13	-	6	19	-	-	-	-	13	-	6	19
Tidal	296	-	-	3	-	3	-	-	-	-	-	3	-	3
9														
Headwater	2,720	4,879	589	619	224	1,432	8,973	41	111	9,125	9,562	660	335	10,557
Backwater	822	-	64	-	-	64	-	-	-	-	64	-	-	64
Tidal	1,915	-	223	1,929	1,140	3,292	-	-	-	-	223	1,929	1,140	3,292
10														
Headwater	252	2,621	15	39	3	57	4,518	637	141	5,296	4,533	676	144	5,353
Tidal	2,254	-	362	21,239	2,637	24,238	-	-	-	-	362	21,239	2,637	24,238
REGION TOTALS														
Headwater	16,062	19,429	43,363	13,158	12,370	68,891	96,455	3,038	11,596	111,089	139,818	16,196	23,966	179,980
Backwater	3,380	-	3,926	521	949	5,396	-	-	-	-	3,926	521	949	5,396
Tidal	4,465	-	585	23,171	3,777	27,533	-	-	-	-	585	23,171	3,777	27,533
Grand Total	(Not Additive)	19,429	47,874	36,850	17,096	101,820	96,455	3,038	11,596	111,089	144,329	39,888	28,692	212,909

Annual damages accruing to other types of development not falling into either the urban or agricultural categories were estimated at $29 million in 1970. These damages will increase about threefold under conditions expected in the year 2020.

Total average annual damage potential in the Lower Mississippi Region is expected to more than double by the year 2020 to about $490 million under national income growth rates or $513 million under regional development economic growth rates.

These damage estimates represent the region's potential for flood damage in the absence of any additional structural or nonstructural solutions beyond those described as existing projects in the preceding discussion of Present Status. It bears repeating that the estimates are based on the assumption that many substantial major flood control works are complete when in fact those improvements are far from complete. The large backlog of construction on these projects must be overcome before the scope and degree of flood protection assumed to exist as a base condition for assessment of remaining flood damages will actually exist. Table 67 provides a summary of future flood damages by WRPA and by source of flooding which will exist with attainment of both the national income (Program A) and regional development (Program B) rates of growth.

Sediment and Erosion.

Present Status. In 1970 approximately 19.3 million acres of land and 11,073 miles of stream banks were affected by erosion in the region. The extent of this erosion, measured in tons of sediment produced, amounted to 132.6 million tons. The average rate of erosion was 6.9 tons per acre, with a high of 13.3 tons per acre in WRPA 3 and a low of 0.8 tons per acre in WRPA 1. Average annual damages from erosion amounted to nearly $14.9 million in 1970, with more than half occurring in WRPA 3. Land use on the eroding acreages included 19 percent cropland, 17 percent grassland, 62 percent woodland, and 2 percent other. Table 68 summarizes sediment and erosion problems and damages occurring in 1970 in the Lower Mississippi Region.

Future Needs. To maintain the present productive level of the land base, prevent deterioration, and validate the unit productive crop yields used in this study will require that sediment and erosion problems be kept within tolerable limits. Future changes in land use and management practices are expected to cause a slight reduction in the extent of erosion, in terms of both acres affected and tons of sediment produced. However, in the absence of additional measures to prevent erosion, the average annual damages in the region are expected to increase by 83 percent and 90 percent between 1970 and 2020 under the National Income and Regional Development Objectives, respectively, due to higher value crops. A summary of projected problems and future needs for erosion protection is given in table 69. Figure 8 depicts graphically the present status and future regional need for sediment

Table 67 - Future Flood Damages, Lower Mississippi Region

WRPA	Time Frame	Program A: Upstream Watersheds	Program A: Principal Streams Headwater	Program A: Principal Streams Backwater	Program A: Total	Program B: Upstream Watersheds	Program B: Principal Streams Headwater	Program B: Principal Streams Backwater	Program B: Total
		Average Annual Damages Due to Flooding ($1,000)							
1	1980	0	3,929	0	3,929	0	4,423	0	4,423
	2000	0	4,470	0	4,470	0	4,962	0	4,962
	2020	0	5,119	0	5,119	0	5,754	0	5,754
2	1980	42,037	36,643	698	79,378	42,179	38,151	692	81,022
	2000	53,673	41,058	853	95,584	57,114	42,030	854	99,998
	2020	69,242	54,082	960	124,284	73,077	56,508	959	130,544
3	1980	10,509	17,940	632	29,081	10,522	17,957	636	29,115
	2000	14,962	27,359	1,013	43,334	15,418	27,948	1,025	44,391
	2020	21,324	43,901	1,678	66,903	21,987	45,070	1,699	68,756
4	1980	29,014	17,827	2,542	49,383	29,026	18,437	2,556	50,019
	2000	35,512	21,936	3,246	60,694	37,521	24,113	3,649	65,283
	2020	43,499	28,382	3,594	75,475	46,076	32,132	4,046	82,254
5	1980	17,349	6,152	1,988	25,489	17,405	6,314	1,998	25,717
	2000	22,286	7,248	2,636	32,170	24,021	7,791	2,842	34,654
	2020	28,951	9,066	3,322	41,339	29,993	9,835	3,578	43,406
6	1980	19,980	4,357	0	24,337	19,999	4,559	0	24,558
	2000	24,025	4,611	0	28,636	25,971	5,087	0	31,058
	2020	29,105	4,766	0	33,871	31,577	5,272	0	36,849
7	1980	4,591	1,845	657	7,093	4,591	1,861	686	7,138
	2000	5,922	2,476	751	9,149	5,992	2,774	835	9,601
	2020	7,982	3,595	849	12,426	8,124	4,084	950	13,158
8	1980	5,170	1,318	29 1/	6,517 1/	5,193	1,318	29 1/	6,540 1/
	2000	7,385	2,078	36 1/	9,499 1/	7,584	2,078	36 1/	9,698 1/
	2020	10,901	3,410	47 1/	14,358 1/	11,141	3,410	47 1/	14,598 1/
9	1980	10,426	1,824	3,765 1/	16,015 1/	10,470	1,824	3,765 1/	16,059 1/
	2000	13,086	2,168	4,545 1/	19,799 1/	13,461	2,168	4,545 1/	20,174 1/
	2020	15,473	2,547	5,515 1/	23,535 1/	16,130	2,547	5,515 1/	24,192 1/
10	1980	6,350	75	34,315 1/	40,740 1/	6,362	75	34,315 1/	40,752 1/
	2000	8,294	118	53,483 1/	61,895 1/	8,764	118	53,483 1/	62,365 1/
	2020	10,545	168	82,166 1/	92,879 1/	11,100	168	82,166 1/	93,434 1/
LMR	1980	145,426	91,910	44,626	281,962 1/	145,747	94,919	44,677 1/	285,343 1/
	2000	185,145	113,522	66,563 1/	365,230 1/	195,846	119,069	67,269 1/	382,184 1/
	2020	237,022	155,036	98,131 1/	490,189 1/	249,205	164,780	98,960 1/	512,945 1/

1/ Includes tidal flooding.

Over 11,000 miles of the region's streams were affected by erosion in 1970.

Approximately 133 million tons of valuable topsoil were lost to erosion in 1970.

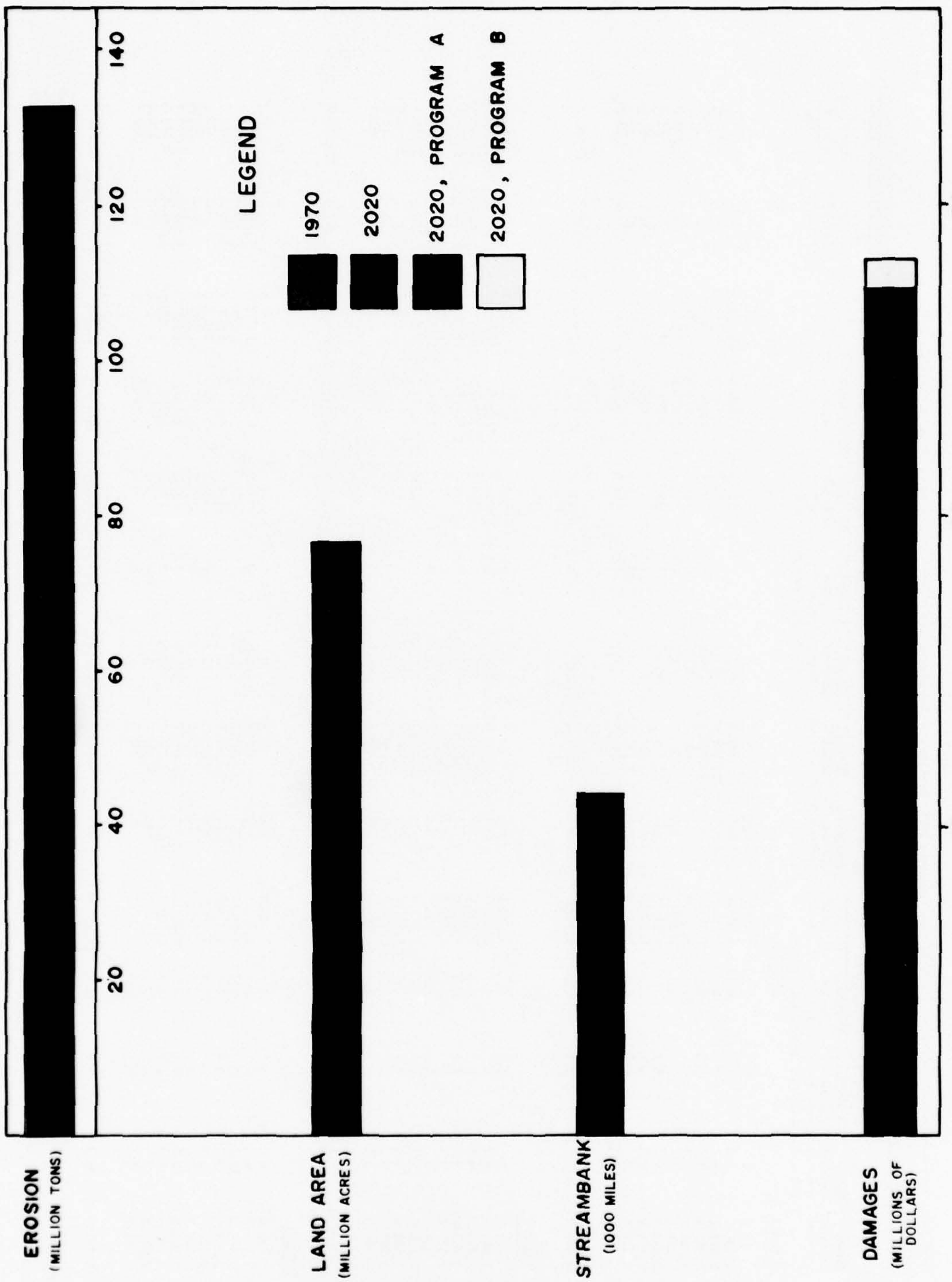
Table 68 - Sediment and Erosion Problems and Damages in 1970, Lower Mississippi Region

WRPA	Land Area Affected by Erosion: Sheet Erosion	Gully Erosion	Floodplain Scour	Roadbank Erosion	Total	Length of Streambank Erosion	Extent of Erosion: Sheet Erosion	Gully Erosion	Floodplain Scour	Roadbank Erosion	Streambank Erosion 1/	Total	Average Annual Damages
	(Thousands of Acres)					(Miles)		(Thousands of Tons)					($1,000)
1	28.6	0	0	0	28.6	486	22.8	0	0	0	0	22.8	-
2	1,760.0	9.4	0	4.5	1,773.9	1,093	11,220.1	2,858.1	0	1,296.4	2,015.3	17,389.9	904.5
3	3,572.4	118.2	0	11.0	3,701.6	2,877	29,800.9	17,479.7	0	1,416.4	450.5	49,147.5	7,728.2
4	2,868.4	9.1	0.6	8.2	2,886.3	2,767	15,107.2	998.2	12.1	675.9	4,624.5	21,417.9	2,722.8
5	5,552.2	0.4	0	11.4	5,564.0	638	8,340.6	87.4	0	347.7	578.0	9,353.7	508.6
6	247.4	0	0	1.6	248.9	766	451.3	1.2	0	6.6	1,874.5	2,333.6	358.9
7	2,500.0	10.8	0.5	5.0	2,516.3	1,432	13,899.0	1,184.5	9.4	499.5	4,443.7	20,036.1	1,539.7
8	1,213.6	5.7	0.2	2.2	1,221.7	820	7,705.5	646.3	4.1	212.2	1,259.5	9,827.6	975.2
9	1,143.7	0	2.7	5.6	1,152.0	149	1,813.0	0	340.7	0.2	19.5	2,173.4	47.0
10	132.5	0.2	0	0.5	133.2	45	708.1	19.9	0.7	41.2	110.2	880.1	66.4
Region Total	19,018.8	153.8	4.0	50.0	19,226.7	11,073	89,068.5	23,275.3	367.0	4,496.1	15,375.7	132,582.6	14,851.3

1/ Erosion problems on the main stem of the Mississippi River are handled in conjunction with the Mississippi River and Tributaries Project and are therefore excluded.

Table 69 - Future Sediment and Erosion Problems and Damages, *Lower Mississippi Region*

WRPA	Land Area Affected by Erosion: Sheet Erosion	Gully Erosion	Floodplain Scour	Roadbank Erosion	Total	Length of Streambank Erosion	Extent of Erosion: Sheet Erosion	Gully Erosion	Floodplain Scour	Roadbank Erosion	Streambank Erosion	Total	Average Annual Damages: N.I. Objective ($1,000) NI	R.D. Objective ($1,000) RD
	(Thousands of Acres)					(Miles)	(Thousands of Tons)							
	1 9 8 0													
1	28.6	0	0	0	28.6	486	22.8	0	0	0	0	22.8		
2	1,686.1	9.3	-	4.4	1,699.8	1,093	10,219.8	2,067.9	0	511.0	2,015.3	14,814.0	1,024.7	1,024.7
3	3,522.1	95.1	0	8.8	3,626.0	2,877	24,595.4	12,393.4	0	1,017.3	450.6	38,456.7	8,753.8	8,846.0
4	2,865.6	9.0	0.3	8.1	2,883.0	2,767	14,069.5	719.8	6.0	268.6	4,624.5	19,688.4	3,774.8	3,774.8
5	5,511.1	0.4	0	11.3	5,222.8	638	7,840.2	63.8	0	139.2	578.0	8,621.2	633.0	633.0
6	223.1	0	0	1.6	224.7	766	368.0	0.9	0	2.7	1,874.5	2,246.1	488.0	488.0
7	2,428.5	10.7	0.2	5.0	2,444.4	1,432	12,126.1	857.7	4.7	198.9	4,443.7	17,631.1	2,037.8	2,037.8
8	1,174.6	5.7	0.1	2.2	1,182.6	820	6,622.5	452.2	2.0	83.9	1,259.4	8,420.0	969.1	969.1
9	1,111.9	0	2.7	5.6	1,120.2	149	1,690.3	0	197.7	0.2	19.5	1,907.7	64.1	73.4
10	120.6	0.2	0	0.5	121.3	45	536.6	13.2	0.3	15.0	110.2	675.3	59.9	59.9
Region Total	18,672.2	130.4	3.3	47.5	18,853.4	11,073	78,091.2	16,568.9	210.7	2,236.8	15,375.7	112,483.3	17,805.2	17,906.7
	2 0 0 0													
1	28.6	0	0	0	28.6	486	22.8	0	0	0	0	22.8	-	-
2	1,600.9	9.2	-	4.3	1,614.4	1,093	9,208.3	1,264.9	0	326.4	2,015.3	12,814.9	1,078.2	1,159.3
3	3,456.0	76.6	0	6.5	3,539.1	2,877	19,549.3	8,804.8	0	649.9	450.6	29,454.6	11,851.1	12,212.4
4	2,811.6	8.9	0.3	7.8	2,828.6	2,767	12,917.7	445.7	6.0	166.7	4,624.5	18,160.6	4,176.6	4,440.1
5	5,377.4	0.4	0	11.2	5,389.0	638	7,339.7	39.3	0	90.6	578.0	8,047.6	717.3	748.0
6	184.6	0	0	1.6	186.2	766	275.9	0.6	0	1.7	1,874.5	2,152.7	553.7	598.2
7	2,415.5	10.7	0.2	5.0	2,431.4	1,432	10,977.1	533.5	4.7	123.6	4,443.7	16,082.6	2,202.0	2,241.1
8	1,165.9	5.6	0.1	2.2	1,173.8	820	6,106.6	290.5	2.0	52.0	1,259.5	7,710.6	1,124.7	1,153.5
9	1,048.5	0	2.7	5.7	1,056.9	149	1,349.0	0	191.4	0.2	19.5	1,560.1	104.9	121.0
10	109.0	0.1	0	0.4	109.5	45	406.6	7.4	0.3	8.4	110.2	532.9	57.4	61.3
Region Total	18,198.0	111.5	3.3	44.7	18,357.5	11,073	68,153.0	11,386.7	204.4	1,419.5	15,375.8	96,539.4	21,865.9	22,734.9
	2 0 2 0													
1	28.6	0	0	0	28.6	486	22.8	0	0	0	0	22.8	-	-
2	1,555.9	9.1	-	4.1	1,569.1	1,093	8,180.1	1,143.0	0	230.9	2,015.3	11,569.3	1,141.9	1,229.7
3	3,379.3	61.7	0	5.2	3,446.2	2,877	15,393.1	6,325.3	0	470.3	450.6	22,639.3	16,178.4	16,612.2
4	2,748.6	8.8	0.3	7.6	2,765.3	2,767	11,529.9	397.1	5.9	118.8	4,624.5	16,676.2	4,585.2	4,887.5
5	5,222.1	0.4	0	11.0	5,233.5	638	6,672.5	35.8	0	66.2	578.1	7,352.6	781.8	813.0
6	154.3	0	0	1.5	155.8	766	207.0	0.5	0	1.3	1,874.5	2,083.3	636.2	691.8
7	2,391.8	10.6	0.2	4.9	2,407.5	1,432	10,051.7	475.4	4.6	97.9	4,443.7	15,073.3	2,413.1	2,476.4
8	1,151.5	5.5	0.1	2.2	1,159.3	820	5,636.7	249.3	2.0	41.1	1,259.5	7,188.6	1,333.6	1,340.4
9	1,003.6	0	2.7	5.6	1,011.9	149	1,152.2	0	191.4	0.2	19.5	1,363.3	178.1	209.0
10	92.0	0.1	0	0.3	92.4	45	282.3	5.5	0.2	5.6	110.2	403.8	49.8	52.7
Region Total	17,727.7	96.2	3.3	42.4	17,869.6	11,073	59,128.3	8,631.9	204.1	1,032.3	15,375.9	84,372.5	27,298.1	28,312.7



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

REGIONAL SEDIMENT AND EROSION
PROBLEMS AND DAMAGES

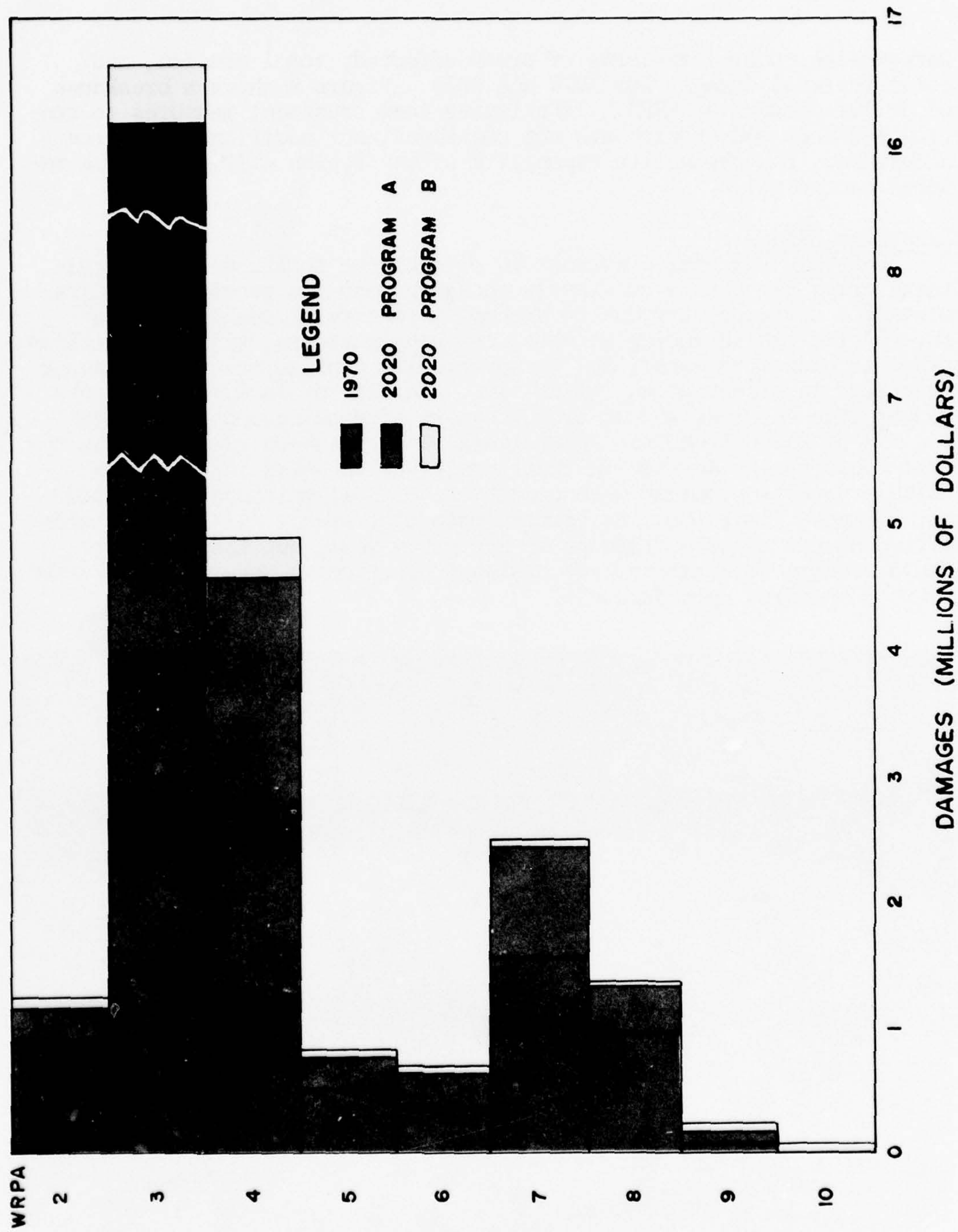
FIGURE 8

and erosion control in terms of areas affected, total erosion, and total regional damages for 1970 and 2020. Figure 9 shows a breakdown of dollar damages by WRPA. If existing land treatment measures to control sediment and erosion are not continued, nor additional measures undertaken, the productive capability of the region will have to be reduced accordingly.

Excessive Wetness

General. Excessive wetness in or near the root zone of agricultural crops presents a constantly changing resource problem. Requirements for drainage vary due to a complex interrelationship between several factors including climate, cropping patterns, tillage practices, plant tolerance to water, and the particular configuration of drainage practices in effect at any given time. An acre of land may produce a bumper crop one year and no crop the next, depending upon the prevailing mix of these factors. Agricultural land has been classified by the Soil Conservation Service in their Conservation Needs Inventory as "with a wetness problem" when conditions of soil moisture or surface water impose limitations to certain potential uses. All lands so classified do not require drainage in any given year, but the same acre could require some alternative drainage practice in several consecutive years, depending upon land use.

Excessive wetness causes significant production loss on valuable cropland.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

SEDIMENT AND EROSION DAMAGES

FIGURE 9

Present Status. In 1970 a total of 33.8 million acres of the region's agricultural land was classified according to the Conservation Needs Inventory as having a wetness problem. Land use on this acreage was 42 percent crops, 41 percent forest, 8 percent pasture, and 9 percent other. Land use and 1970 drainage configuration were such that only 8.4 million acres were in a wetness condition which caused losses to agricultural production. The remaining 25.4 million acres of excessively wet acreage included 17.0 million acres of forest land and other land that did not need to be drained and 8.4 million acres of cropland and pasture that had already been drained. Losses on the undrained agricultural lands were limited to crops and pasture, with affected acres composed of 8 million acres in crops and 400,000 acres in pasture. A breakdown of these acres by WRPA is given in table 70.

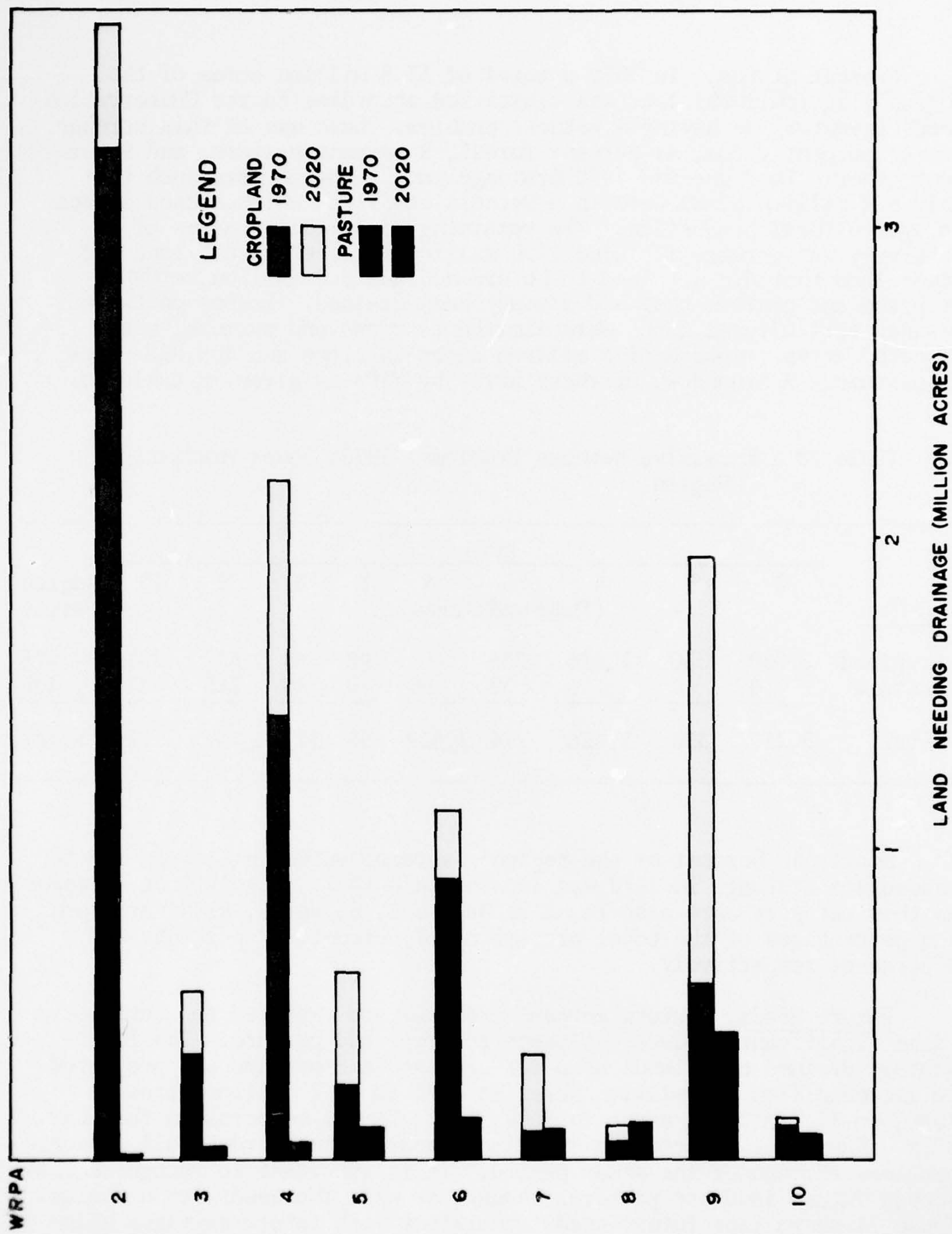
Table 70 - Excessive Wetness Problems, 1970, Lower Mississippi Region

	WRPA									
Land Use	2	3	4	5	6	7	8	9	10	Region Total
	(Thousand Acres)									
Cropland	3,250	330	1,426	235	912	98	64	1,552	111	7,978
Pasture	0	0	0	39	116	0	48	215	21	439
Total	3,250	330	1,426	274	1,028	98	112	1,767	132	8,417

Nearly 40 percent of the region's acreage suffering losses due to inadequate drainage in 1970 was located in WRPA 2. Significant acreages in this category were also found in WRPA's 4, 6, and 9, with corresponding percentages of the total problem of 17 percent, 12 percent, and 9 percent, respectively.

Future Needs. Future wetness problems are expected to continue to cause significant production losses to crops and pasture. The inadequately drained open lands used for cropland and pasture are projected to increase from 8.4 million acres in 1970 to 10.2 million acres in 1980, to 11.1 million acres in 2000, to 11.7 million acres in the year 2020. WRPA 2 is expected to experience nearly one-third of all drainage problems throughout the study period. It is important to recognize that should future land use patterns change, so will the needs for drainage. Table 71 summarizes future needs consistent with future acreages allocated to cropland and pasture. Figure 10 illustrates the 1970 and exoected 2020 acreages requiring drainage by WRPA.

The expressed needs represent the acreages on which gains in economic efficiency could be realized through drainage improvements.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

LAND DRAINAGE NEEDS

FIGURE 10

Of the indicated regional acreages, only 1.3 million acres in 1980, 3.9 million acres in 2000, and 6.5 million acres in the year 2020 are considered absolute needs for food and fiber requirements.

Table 71 - Future Land Drainage Needs, Lower Mississippi Region

Land Use	WRPA 2	3	4	5	6	7	8	9	10	Region Total
	(Millions of Acres)									
1980										
Cropland	3.37	0.52	1.91	0.45	1.01	0.37	0.11	1.74	0.12	9.60
Pasture	-	0	0.02	0.06	0.12	0.01	0.07	0.26	0.04	0.58
Total	3.37	0.52	1.93	0.51	1.13	0.38	0.18	2.00	0.16	10.18
2000										
Cropland	3.62	0.57	2.04	0.55	1.07	0.33	0.10	1.87	0.12	10.27
Pasture	0	0	0.02	0.07	0.12	0.08	0.10	0.33	0.07	.79
Total	3.62	0.57	2.06	0.62	1.19	0.41	0.20	2.20	0.19	11.06
2020										
Cropland	3.69	0.59	2.17	0.61	1.13	0.34	0.11	1.93	0.13	10.70
Pasture	0.01	0.03	0.04	0.11	0.12	0.10	0.12	0.41	0.10	1.04
Total	3.70	0.62	2.21	0.72	1.25	0.44	0.23	2.34	0.23	11.74

Water Quality

Present Status. Waters in the study area are considered good for most uses. However, notable exceptions do exist, usually as a result of waste discharges, agricultural chemicals, salt-water intrusion from the Gulf of Mexico, localized mineral deposits, or unregulated underground disposal of wastes. East of the Mississippi River, the region's water is generally soft and low in mineral content, with hardness as calcium carbonate usually less than 50 milligrams per liter. West of the river, hardness and dissolved-solids content varies drastically with concentrations generally increasing from north to south. In the uppermost portion of the study area, total dissolved solids range between 100 and 350 milligrams per liter, while in the coastal area concentrations range up to 18,000 milligrams per liter. Brine from oil field

waste and saltwater intrusion from the Gulf of Mexico primarily account for the high dissolved solids in that area. Bacteriological quality, although variable, generally reflects the density of urban, industrial, or agricultural development. The greatest contributions to bacterial pollution come from domestic-waste discharges, primarily those from municipalities.

Oil spills are one of many non-BOD pollutants that cause serious problems in many parts of the region.

Water quality records of at least a 3-year duration are available at some 460 monitoring stations in the region. Federal and State agencies operate these stations to obtain basic data necessary for assessing the quality of water from surface and underground supplies. Data gathered to date provide a satisfactory basis for assessment of certain aspects of water quality, but are inadequate for a meaningful analysis of inorganic pollutants and their effects.

Waste loads generated in the region receive varying degrees of treatment. As of 1970, there were 315 sewered communities of 1,000 or

more inhabitants in the study area, 295 of which operated sewage treatment plants. Secondary treatment was provided at 268 locations while primary treatment was provided at 25 locations. Only slightly more than 40 percent of the region's population was served by these facilities. Average levels of treatment of municipal wastes varied by State from 50 to 80 percent BOD_5 removal, while industrial treatment in terms of percent BOD_5 removal was roughly 55 percent regionwide. Removal of harmful bacteria as a component of conventional treatment varied drastically by State, ranging from 5 percent in Missouri to 100 percent in Tennessee. Bacterial pollution was most pronounced in WRPA's 3 and 10 in 1970 in the Memphis and New Orleans areas.

A fairly reliable compilation of data are available covering municipal waste treatment facilities, but similar data for industry are scarce. Studies for Appendix L, Water Quality and Pollution, investigated the region's pollution problems only insofar as existing data and reports would permit. This methodology produced a good assessment of biodegradable wastes from sewered communities, agricultural pursuits, and the 1,059 industries in the region known to produce biodegradable wastes. Problems of bacterial pollution are also adequately addressed in Appendix L. However, because of insufficient data for quantifying the discharge of non-BOD wastes (i.e.; thermal wastes, heavy metals, nutrients, toxics, odor, color, phenolics, pH, and oil and grease), the problem caused by these pollutants, though recognized as being quite serious, was addressed only in broad general terms. Table 72 gives the status of treatment of biodegradable wastes and bacteria as of 1970.

Recent unpublished and published reports by the Environmental Protection Agency regarding the problem caused by industrial pollutants discharged to the Mississippi River in Louisiana recognize complex and often highly concentrated non-BOD wastes from numerous industries. Pollutants and related problems noted included temperature, heavy metals, taste and odor, chemical oxygen demand, organic chemicals, pH, and oil and grease. Between St. Francisville and Venice, Louisiana, 60 industries discharge such pollutants into a reach of the river which serves as raw water supply for 40 utilities serving some 1.5 million of the region's residents. Heavy metals, nutrients, toxics, and odor and color causing substances were present in discharges from the industrialized Baton Rouge-New Orleans area. Heavy metals such as cadmium, chromium, copper, lead, mercury, and zinc were regularly discharged in large quantities. Table 73 presents a summary of recognized non-BOD pollutant discharges.

A survey of fishermen and wholesale fish dealers, made in conjunction with the above study, revealed that fish caught in the river below Baton Rouge were not saleable because of off-flavors in their flesh. Six organic chemicals found in trace amounts in treated water supplies at two locations have been shown to induce histo-pathological changes in animals in chronic toxicity studies. Three organic chemicals found in treated water supplies at two locations have been shown to be carcinogenic (cancer producing).

Table 72 - Status of Treatment, Biodegradable Wastes and Bacteria, 1970, Lower Mississippi Region

Waste Discharge and Treatment	Planning Area WRPA 2	WRPA 3	WRPA 4	WRPA 5	WRPA 6
Municipal and Industrial					
Total Waste Load (1,000# BOD_5)	90.9	508.3	139.6	899.1	181.0
Existing Treatment (Percent)					
Municipal	80.0	79.0	50.0	66.0	58.0
Industrial	55.0	55.0	55.0	55.0	55.0
Waste Load Removed by Existing Treatment (1,000# BOD_5)	63.5	226.5	74.5	502.4	99.0
Net Waste Load to Region's Waters (1,000# BOD_5)	27.4	281.8	65.1	396.7	81.1
Agricultural					
Total Waste Load (1,000# BOD_5)	577.0	824.0	894.0	1060.0	370.0
Assimilated by Land Disposal or other Means (1,000# BOD_5)	552.7	785.1	862.8	1008.9	361.0
Net Waste Load to Region's Waters (1,000# BOD_5)	24.3	38.9	31.2	51.1	9.0
Bacterial					
Flow Containing Harmful Bacteria (m.g.d.)	37.6	115.0	40.3	36.0	6.1
Treatment Level (percent)	10.0	24.0	30.0	53.0	75.0
Flow Adequately Treated (m.g.d.)	3.5	27.3	12.1	19.0	4.6
Remaining Flow with Bacterial Problem (m.g.d.)	34.1	87.7	28.2	17.0	1.5

Waste Discharge and Treatment	WRPA 7	WRPA 8	WRPA 9	WRPA 10	Region
Municipal and Industrial					
Total Waste Load (1,000# BOD_5)	186.7	404.4	486.1	705.5	3601.6
Existing Treatment (percent)					
Municipal	50.0	50.0	50.0	50.0	N/A
Industrial	55.0	55.0	55.0	55.0	N/A
Waste Load Removed by Existing Treatment (1,000# BOD_5)	102.3	220.1	263.3	381.3	1933.8
Net Waste Load to Region's Waters (1,000# BOD_5)	84.4	184.3	222.8	324.2	1667.8
Agricultural					
Total Waste Load (1,000# BOD_5)	462.0	522.0	682.0	91.0	5482.0
Assimilated by Land Disposal or other Means (1,000# BOD_5)	443.2	499.7	659.1	88.1	5260.6
Net Waste Load to Region's Waters (1,000# BOD_5)	18.8	22.3	22.9	2.9	221.4
Bacterial					
Flow Containing Harmful Bacteria (m.g.d.)	6.4	33.6	59.4	179.6	514.0
Treatment Level (percent)	30.0	75.0	75.0	75.0	N/A
Flow Adequately Treated (m.g.d.)	1.9	25.2	44.5	134.7	272.8
Remaining Flow with Bacterial Problem (m.g.d.)	4.5	8.4	14.9	44.9	241.2

Table 73 - Recognized non-BOD Pollutants Entering the Mississippi River in Louisiana, 1972, Lower Mississippi Region

Pollutant	Location (WRPA)	No. Plants Discharging	Amount Discharged	Allowable Maximum[1/]
Excessive Temperature	10	Numerous	124° F. Max.	96.8° F.
Heavy Metals	8 & 10	42	5#/day or more each plant	Varies
Lead	8 & 10	21	5#/day or more each plant	Varies
Chromium	8 & 10	29	5#/day or more each plant	Varies
Zinc	8 & 10	29	5#/day or more each plant	Varies
Cadmium	8 & 10	8	5#/day or more each plant	Varies
Arsenic	8 & 10	5	5#/day or more each plant	Varies
Cyanide	8 & 10	5	Measurable Amounts	Varies
Phenolics	8 & 10	17	10# or more/ day each plant	Varies
13 Organic Chemicals	8 & 10	7	Trace Amts.	Varies
44 Organic Chemicals	8 & 10	10	Trace Amts.	Varies
Chemical Oxygen Demand	8 & 10	15	40,000# or more/day/ plant	Varies
Organic Carbon	8 & 10	10	20,000# or more/day/ plant	Varies
Total Solids	8 & 10	32	50,000# or more/day/ plant	Varies
Volatile Solids	8 & 10	26	25,000# or more/day/ plant	Varies
Odors	8 & 10	60	Discernable	Varies

1/ Allowable maximums vary among individual dischargers, based on type of industry and on quantity of discharge.

As a result of requirements by the State of Louisiana and/or by the Refuse Act Permit Program of the Corps of Engineers and the Environmental Protection Agency, many industries have initiated waste abatement programs.

Similar data are not available for other industrial areas in the region. A logical conclusion, however, would be that similar problems exist regionwide, making nonbiodegradable wastes clearly as serious a water quality problem in the study area as are biodegradable and bacterial problems. The total regional water pollution problem was placed in proper perspective though by including total cost of cleanup based on an update of available estimates of cost.

Serious water quality problems in the region are generally the result of waste loads generated in large metropolitan areas and industrial complexes, but loads of lesser magnitude also cause problems when streams, which normally assimilate these wastes, reach critically low or zero flow condition. In addition to municipalities and industries, other point source pollutants are contributed by feedlots and other agricultural activities, navigation (including oil spills), and mineral extraction.

While not as clearly defined as these point source loads, untreated wastes generated by recreationists also contribute to water quality degradation. Areas such as lakes, which provide a high quality boating experience, are often severely degraded from this source alone.

Oil pollution caused by accidental spills, fires, leaks, and illegal discharges to both fresh and marine waters is a significant problem, particularly in the southern portion of the region where extensive oil and natural gas operations exist. An associated problem is the improper disposal of oil-field brines. Extremely high dissolved solid concentrations have been experienced as a direct result of oil-field brine contamination.

Untreated or inadequately treated municipal and industrial wastes have created water quality problems in reaches of several of the region's streams, including the Mississippi, Arkansas, Ouachita, Calcasieu, and Vermilion Rivers and Bayou Teche. These problems include one or more of the following: high concentrations of bacteria, low dissolved oxygen content, unsavory tastes and odors, extensive sludge beds, low aesthetic values, excessive temperature increases, and increases in concentration of toxic materials, nutrients, and heavy metals. Several of the region's lakes are similarly polluted. Most prominent problems exist in Lakes Pontchartrain, Maurepas, and Verret in the coastal WRPA's, in Arkabutla, Enid, Sardis, and Tchula Lakes in Mississippi, and in Catahoula Lake in Arkansas.

Agricultural waste has been the cause of numerous fish-kills throughout the region. The over-use of pesticides and herbicides and their ultimate transport to the region's waters by way of surface runoff is a continuous problem because of extensive agricultural development. Also associated with agriculture is the enrichment of water by runoff containing fertilizers.

In addition to organic waste-loads, problems stemming from the other pollutants mentioned above are expected to increase significantly. The bacterial problem is expected to be roughly two and one half times as serious regionwide by 2020 as at present. WRPA's 8 and 10 are expected to pose the most serious problem of bacterial pollution, while WRPA 6 will be least troublesome.

Future water quality in the region will be affected mainly by several economic activities directly tied to a predicted increase in population. Economic indicators point to increases in industrial expansion, agricultural production, and recreational activity. All will be accompanied by corresponding increases in the generation of waste products. Looking ahead to 1980 and beyond to 2000 and 2020, these indicators provide the basis for (1) projecting the quantity and location of wastes, (2) determining the means to preserve water quality, and (3) formulating adequate water quality management programs.

Future Needs. Projected organic waste loads are presented in table 74. Figure 11 illustrates biodegradable waste problems and needs graphically.

A need exists for additional data gathering studies and research on the amount and seriousness of all pollutants regionwide. A comprehensive water quality improvement program should be initiated covering all municipal, industrial, and agricultural pollution sources and present methods and effectiveness of waste-water treatment. Additional data are also needed on stream and lake water quality. This more detailed pollution source inventory and water quality surveillance system would establish a base-line record for all major streams and lakes. Moreover, it would provide more information for determining major patterns of pollution under present conditions and for making broad predictions of future water quality conditions under projected changes in population and economic activity. The program should include studies and research projects related specifically to the topics discussed in this report's final section.

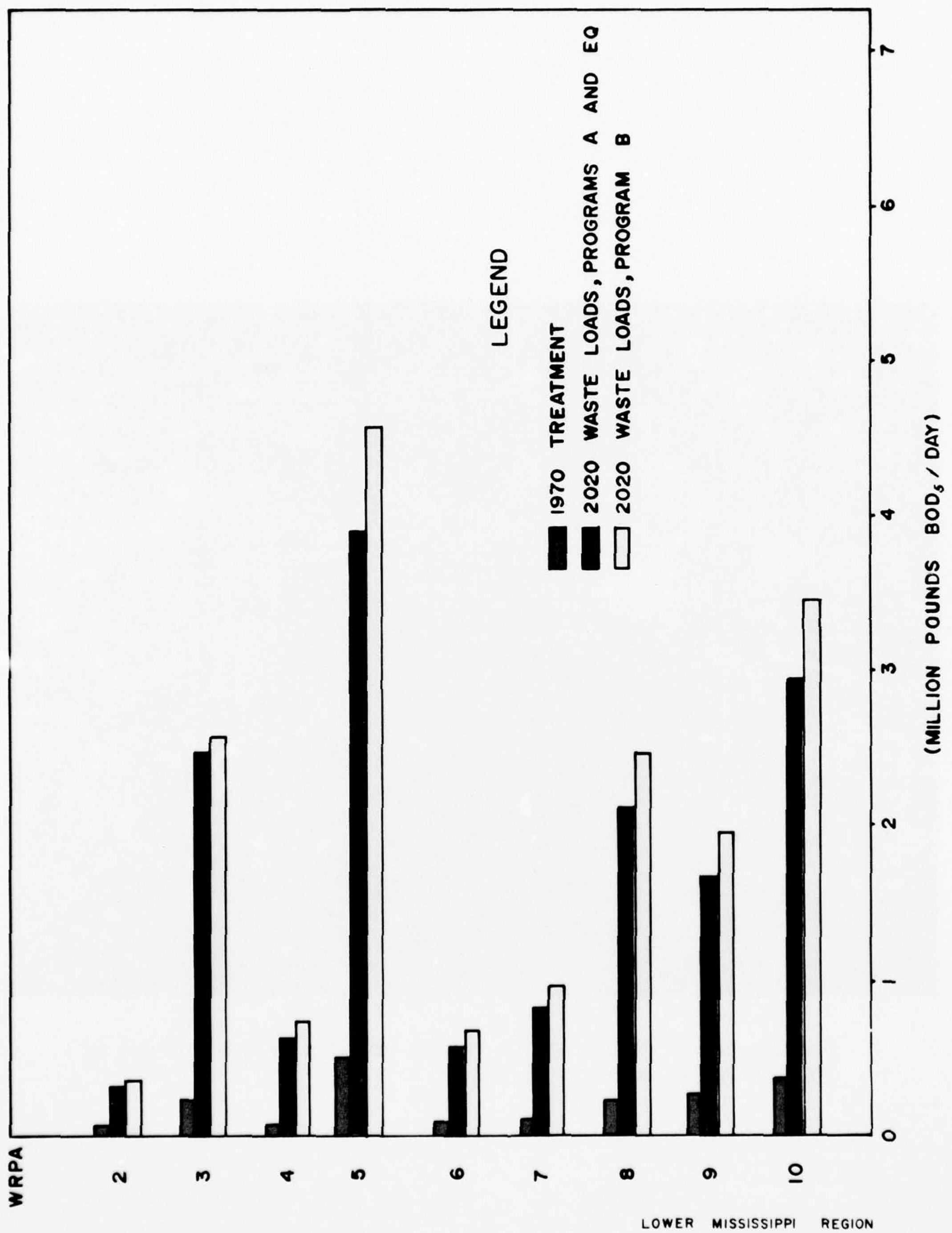
Navigation

Present Status. In 1970 one out of every seven tons of the Nation's waterborne commerce was moved on the waterways and through ports in the Lower Mississippi Region. Important commodities moved were petroleum and petroleum products, industrial chemicals, grain and grain products, iron and steel products, nonmetallic minerals, and unprocessed marine shells. On a ton-mile basis, the region's 84 billion ton-miles of traffic amounted to a little over one-fourth of the United States total. Most of the movement was on the Mississippi River and the Intracoastal Waterway. A generalized breakdown of the region's 1970 waterborne commerce, based on detailed information from Appendix J, Navigation, is presented in table 75. Details on the regional waterways and ports that handled this commerce can be found in Appendix D, Inventory of Facilities.

Table 74 - Projected Daily Biodegradable Waste Loads, Lower Mississippi Region

		Gross Needs (1,000 #BOD_5)			Removed By Existing Treatment	Remaining Needs (1,000 #BOD_5)		
WRPA	Objective	1980	2000	2020	1970	1980	2000	2020
2	NI-EQ	135	197	313	64	71	133	249
	RD	144	221	353	64	80	157	289
3	NI-EQ	727	1,315	2,469	226	501	1,089	2,243
	RD	795	1,499	2,571	226	569	1,273	2,345
4	NI-EQ	204	312	541	74	130	238	467
	RD	219	354	627	74	145	280	553
5	NI-EQ	1,191	2,064	3,908	502	689	1,562	3,406
	RD	1,304	2,376	4,584	502	802	1,874	4,082
6	NI-EQ	206	323	588	100	106	223	488
	RD	224	372	689	100	124	272	589
7	NI-EQ	259	441	823	103	156	338	720
	RD	282	508	967	103	179	405	864
8	NI-EQ	590	1,064	2,103	220	370	844	1,883
	RD	645	1,248	2,468	220	425	1,028	2,248
9	NI-EQ	622	975	1,669	263	359	712	1,406
	RD	673	1,127	1,956	263	410	864	1,693
10	NI-EQ	961	1,631	2,942	381	580	1,250	2,561
	RD	1,047	1,917	3,447	381	666	1,536	3,066
LMR1/	NI-EQ	4,891	8,317	15,347	1,934	2,957	6,383	13,413
	RD	5,326	9,575	17,651	1,934	3,392	7,641	15,717

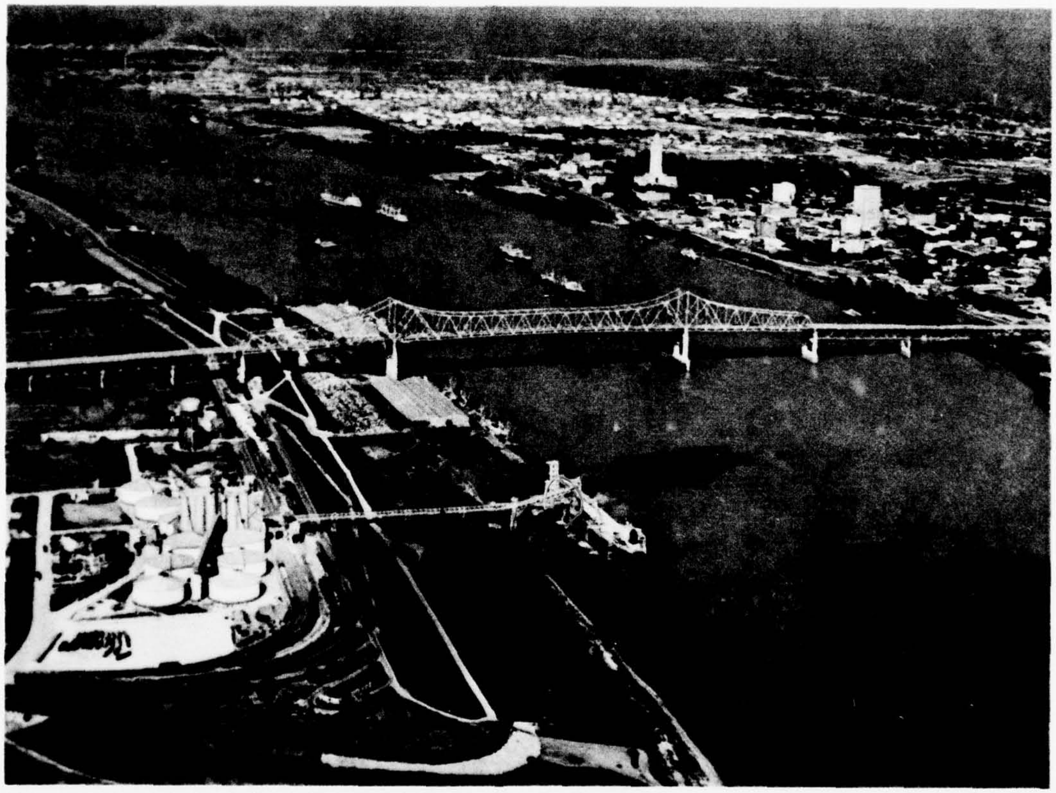
1/ Regional totals will not match addition of WRPA totals exactly due to rounding.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

PROJECTED WASTE LOADS

FIGURE 11



Waterways and ports in the region moved a large portion of the Nation's commerce in 1970.

Table 75 - 1970 Waterborne Commerce, Lower Mississippi Region

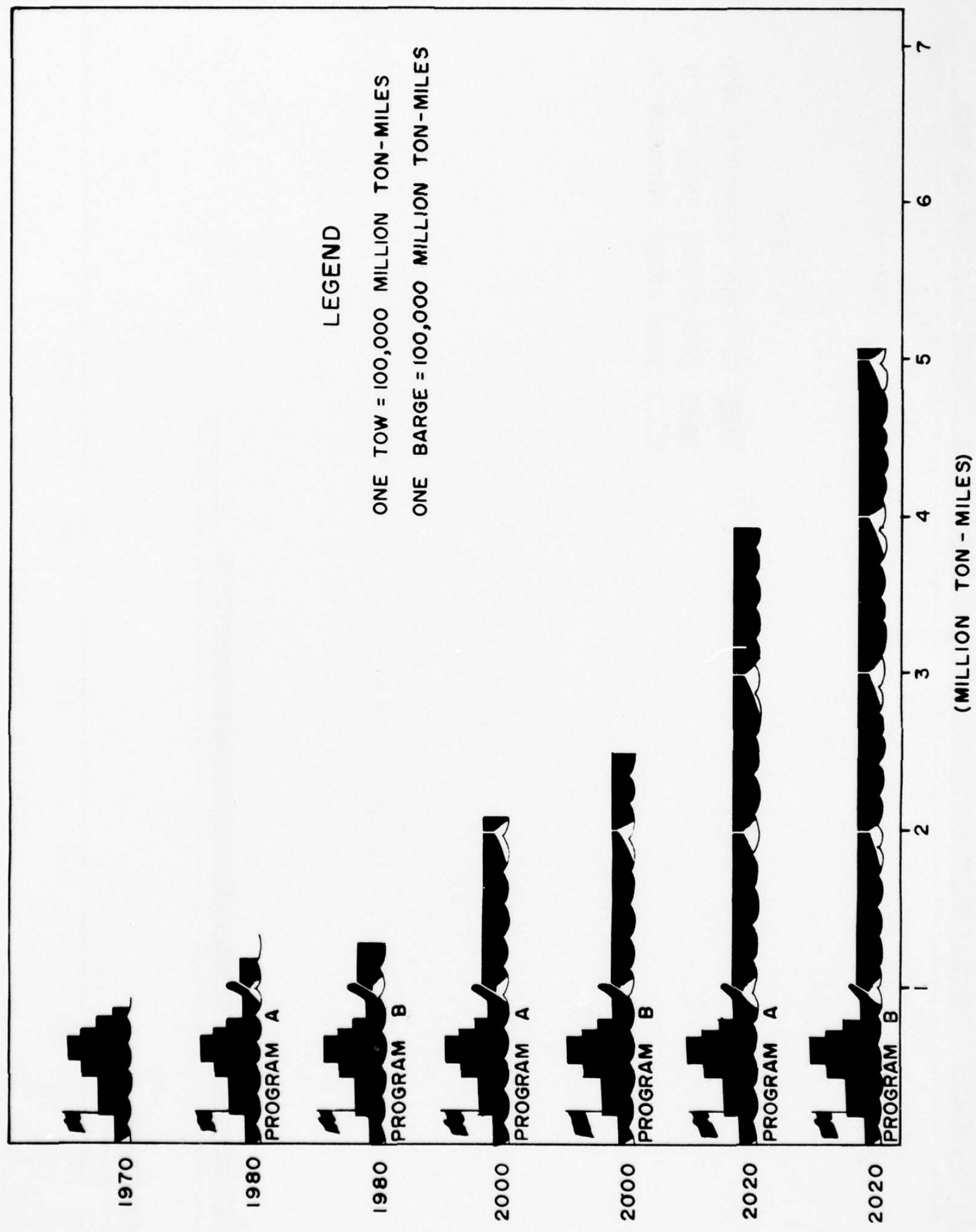
WRPA	Waterways (Million Ton-miles) Shallow Draft[1]	Deep Draft[2]	Total	Ports (Million Short Tons) Inland	Coast-wise	Foreign	Total
1	58,421	12,556	70,977	-	-		
2	324	0	324	7	0	0	7
3	0	0	0	10	0	0	10
4	25	0	25	6	0	0	6
5	81	0	81	1	0	0	1
6	0	0	0	2	0	0	2
7	0	0	0	1	0	0	1
8	1,014	0	1,014	22	10	14	46
9	8,486	172	8,658	17	3	2	22
10	2,774	173	2,947	60	31	32	123
LMR	71,125	12,901	84,026	126	44	48	218

1/ Includes commerce on the Mississippi, Arkansas, White, Yazoo, Ouachita, Black, Atchafalaya, and Vermilion Rivers, and on the Gulf Intracoastal Waterway and other smaller waterways, including numerous bayous in WRPA's 9 and 10.
2/ Includes commerce on the Mississippi River below Baton Rouge, Louisiana, the Atchafalaya River between Morgan City, Louisiana, and the Gulf, and on the Calcasieu River.

Future Needs. Based on Program A projections, the regional waterway system in the year 2020 will be required to accommodate almost 400 billion ton-miles of traffic if the National Income objective is achieved. Realization of the Regional Development objective for 2020 will require the movement of about 500 billion ton-miles of traffic. Projections of waterborne commerce in the region are summarized in table 76. The relative magnitude of the 1970 and 2020 traffic is illustrated in figure 12. Figures 13 and 14 depict predicted needs for waterways and ports by WRPA.

Table 76 - Projected Waterborne Commerce, Lower Mississippi Region

		Program A							Program B						
		Waterways (Million Ton-Miles)			Ports (Thousand Short Tons)				Waterways (Million Ton-Miles)			Ports (Thousand Short Tons)			
WRFA	Time Frame	Shallow Draft	Deep Draft	Total	Inland	Coast-wise	Foreign	Total	Shallow Draft	Deep Draft	Total	Inland	Coast-wise	Foreign	Total
1	1980	79,283	16,729	96,012	-	-	-	-	86,458	18,163	104,621	-	-	-	-
	2000	142,266	28,236	170,502	-	-	-	-	171,873	34,452	206,325	-	-	-	-
	2020	268,118	51,092	319,210	-	-	-	-	354,397	67,952	422,349	-	-	-	-
2	1980	420	0	420	8,609	0	0	8,609	451	0	451	9,274	0	0	9,274
	2000	694	0	694	15,881	0		15,881	795	0	795	18,263	0	0	18,263
	2020	1,195	0	1,195	29,734	0	0	29,734	1,238	0	1,238	34,961	0	0	34,961
3	1980	0	0	0	12,197	0	0	12,197	0	0	0	14,776	0	0	14,776
	2000	0	0	0	23,708	0	0	23,708	0	0	0	29,239	0	0	29,239
	2020	0	0	0	45,007	0	0	45,007	0	0	0	55,172	0	0	55,172
4	1980	216	0	216	9,508	0	11	9,519	237	0	237	12,062	0	12	12,074
	2000	539	0	539	22,539	0	23	22,562	623	0	623	26,068	0	26	26,094
	2020	861	0	861	37,262	0	37	37,299	1,015	0	1,015	43,948	0	44	43,992
5	1980	210	0	210	2,227	0	0	2,227	230	0	230	2,441	0	0	2,441
	2000	379	0	379	3,759	0	0	3,759	438	0	438	4,347	0	0	4,347
	2020	720	0	720	6,735	0	0	6,735	847	0	847	7,943	0	0	7,943
6	1980	0	0	0	3,614	0	0	3,614	0	0	0	3,962	0	0	3,962
	2000	0	0	0	4,705	0	0	4,705	0	0	0	5,411	0	0	5,411
	2020	0	0	0	8,199	0	0	8,199	0	0	0	9,670	0	0	9,670
7	1980	0	0	0	1,760	0	4	1,764	0	0	0	1,929	0	5	1,934
	2000	0	0	0	5,227	0	14	5,241	0	0	0	6,045	0	16	6,061
	2020	0	0	0	7,288	0	19	7,307	0	0	0	8,595	0	22	8,617
8	1980	1,516	0	1,516	30,243	12,723	18,903	61,869	1,624	0	1,624	33,323	14,236	20,350	67,909
	2000	3,086	0	3,086	55,540	21,032	33,305	119,877	3,457	0	3,457	70,027	26,751	41,219	137,997
	2020	6,536	0	6,536	109,490	38,468	61,440	209,398	7,540	0	7,540	149,314	52,708	83,584	285,606
9	1980	12,338	236	12,574	23,347	4,582	2,664	30,593	13,426	257	13,683	25,415	4,986	2,899	33,300
	2000	23,433	439	23,872	43,855	8,474	4,927	57,256	28,531	505	29,036	50,452	9,753	5,670	65,879
	2020	46,453	2,111	48,563	86,125	16,592	9,647	122,364	54,425	2,474	56,899	101,001	19,467	11,318	131,786
10	1980	3,917	332	4,249	79,188	40,752	42,960	162,900	4,147	360	4,507	86,276	45,686	45,389	177,351
	2000	7,100	609	7,709	130,770	64,812	72,858	268,440	7,844	732	8,576	157,717	80,005	85,797	323,519
	2020	13,750	1,138	14,888	231,894	112,101	130,676	474,671	15,343	1,518	16,861	303,841	150,995	167,828	622,664
LMR	1980	97,901	17,297	115,198	170,693	58,057	64,542	294,561	106,573	18,781	125,354	189,458	64,908	68,655	323,021
	2000	177,497	29,284	206,781	305,984	94,318	111,127	511,283	213,561	35,689	249,250	367,603	116,509	132,728	616,840
	2020	337,633	54,341	391,974	561,734	167,161	201,819	930,461	434,806	71,944	506,750	714,415	223,170	262,796	1,200,411



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

WATERBORNE COMMERCE
LOWER MISSISSIPPI REGION

FIGURE 12

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LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY. APPENDIX T. PLAN --ETC(U)
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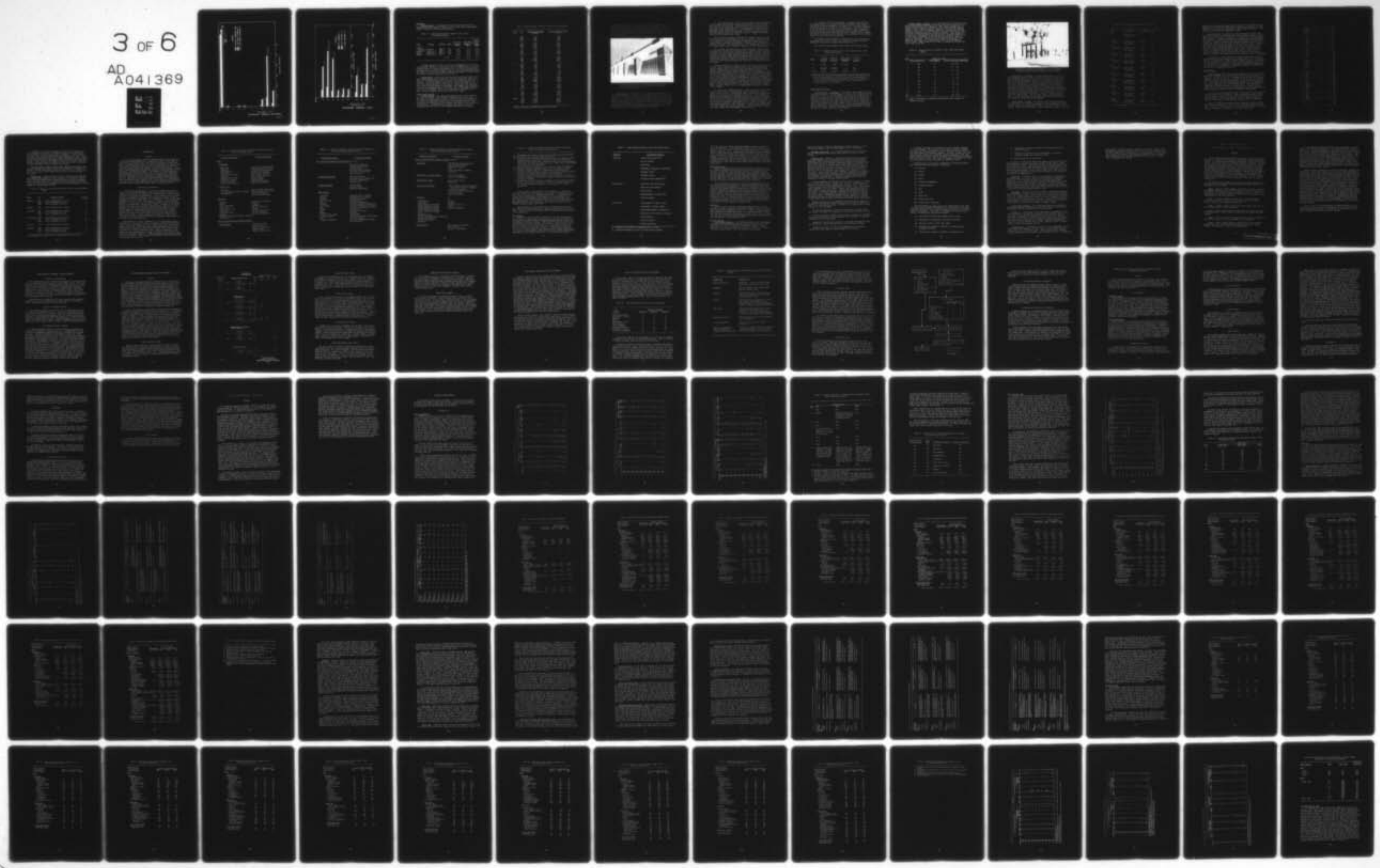
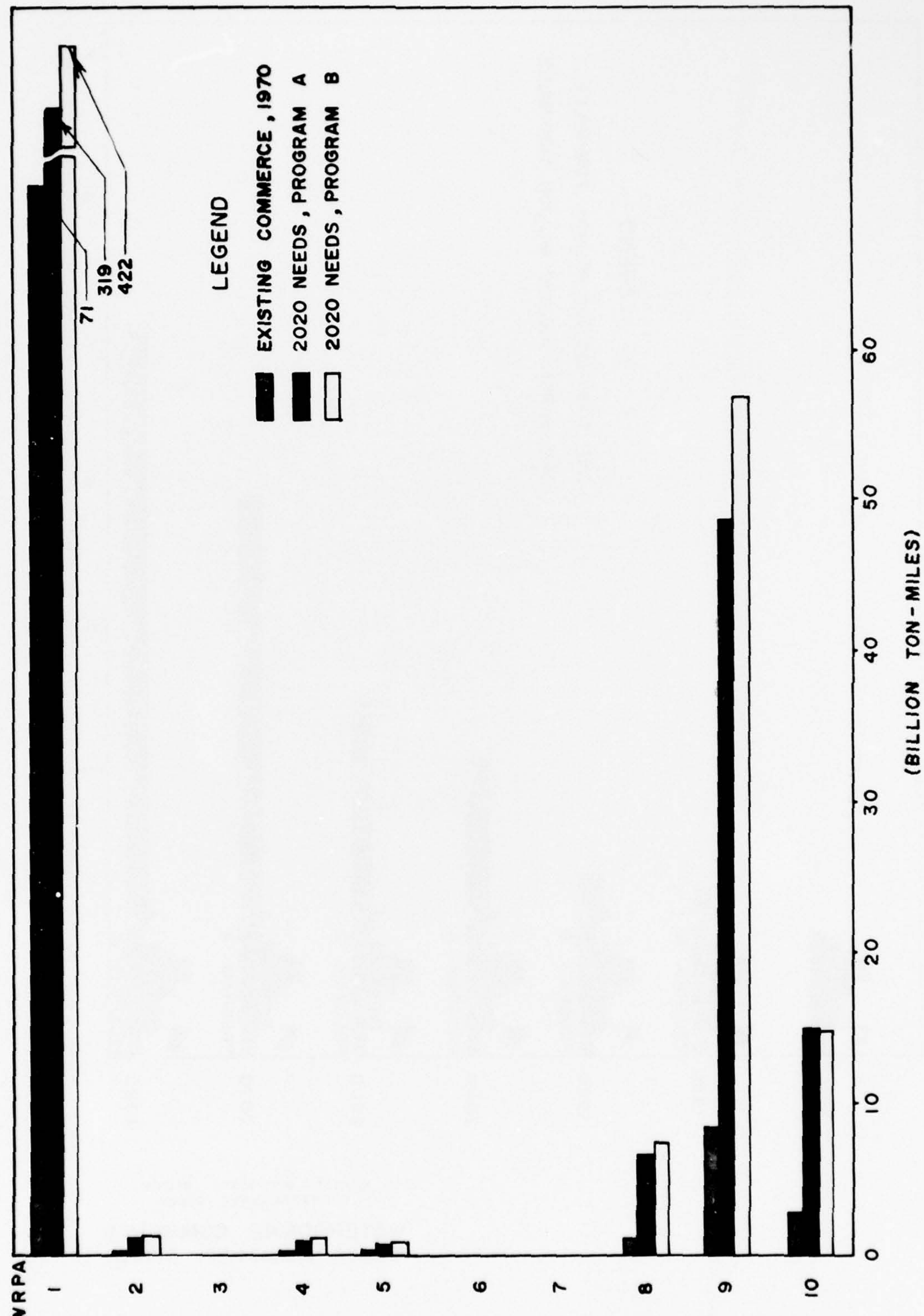
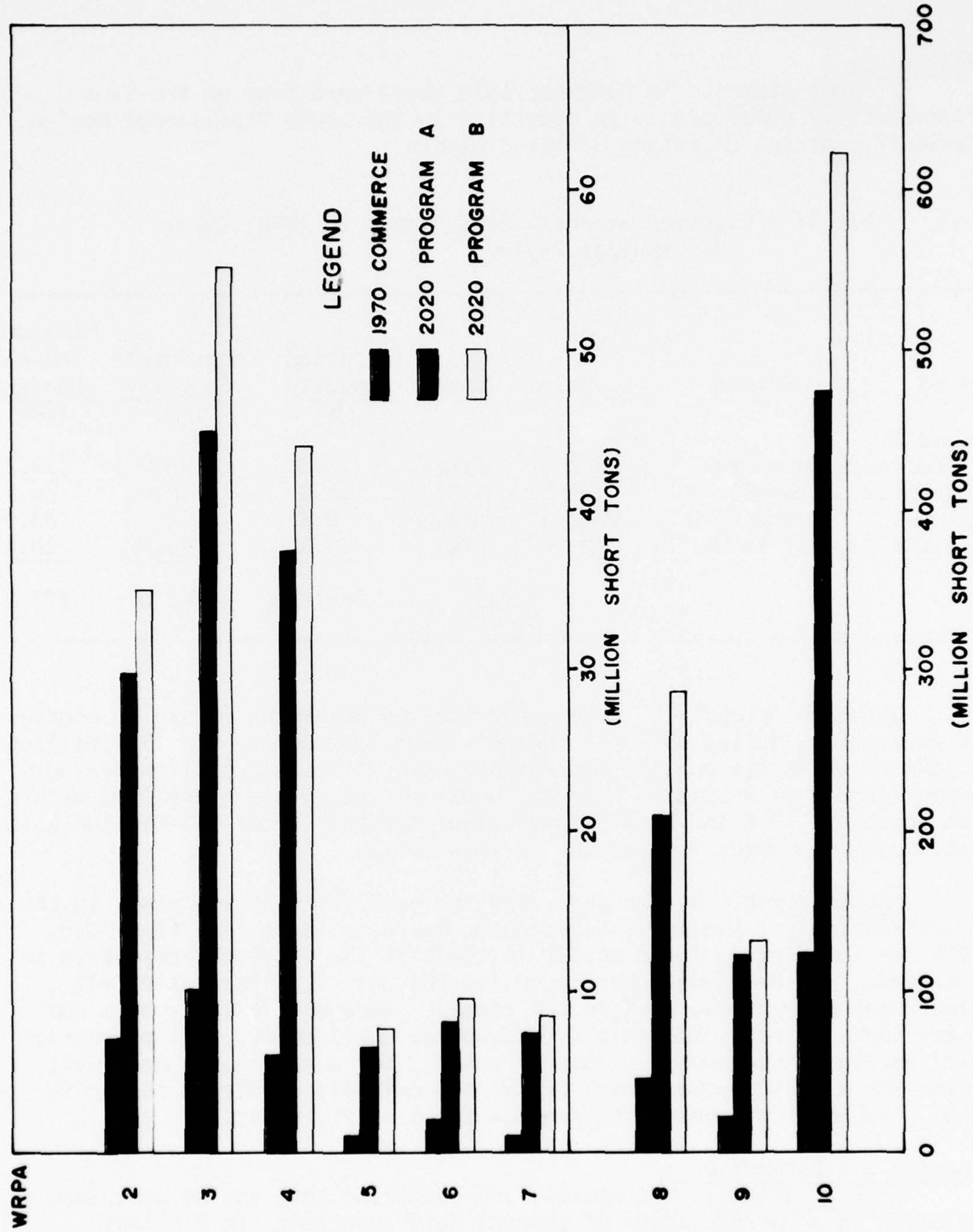




LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

WATERBORNE COMMERCE, WATERWAYS

FIGURE 13



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

WATERBORNE COMMERCE , PORTS

FIGURE 14

Hydropower

Present Status. In December 1970 there were four on-the-line hydroelectric power plants in operation in the Lower Mississippi Region. Table 77 contains a listing of these plants.

Table 77 - Existing Hydroelectric Plants in 1970, Lower Mississippi Region

Plant	Stream	Location	State	Installed Capacity (MW)	Dependable Capacity (MW)	Minimum Annual Energy (GWh)
Blakely Mountain	Ouachita	WRPA 5	Ark.	75.0	75.0	139.2
Carpenter	Ouachita R.	WRPA 5	Ark.	56.0	56.0	76.6
Remmel	Ouachita R.	WRPA 5	Ark.	9.3	10.0	43.0
Narrows	Little Mo. R.	WRPA 5	Ark.	25.5	21.0	18.4
			Total	165.8	162.0	277.2

Although Appendix R, Power, provides no breakdown of use by source of generation, during 1970 the region's peak load demand was 15.1 million kilowatts while its energy requirements were 71.2 billion kilowatt-hours. Approximately 51.0 billion kilowatt-hours of energy were generated within the region in 1970 and hydro plants generated only about 0.3 billion kilowatt hours, or about 0.6 percent of this total.

Future Needs. By the year 2020 the need for electric power in the Lower Mississippi Region is expected to increase about nine times over 1970 use for Program A and nearly 10 times if the Program B objective is achieved. In 1970 hydropower accounted for only 0.65 percent of all electrical energy generated in the region. Because the study area contains very few sites amenable to hydropower development, this percentage will decline throughout the next 50 years. Yet a continuing need will exist for all hydropower which can be economically developed in the region. Table 78 presents future needs for electric power.

Coastal and Estuarine

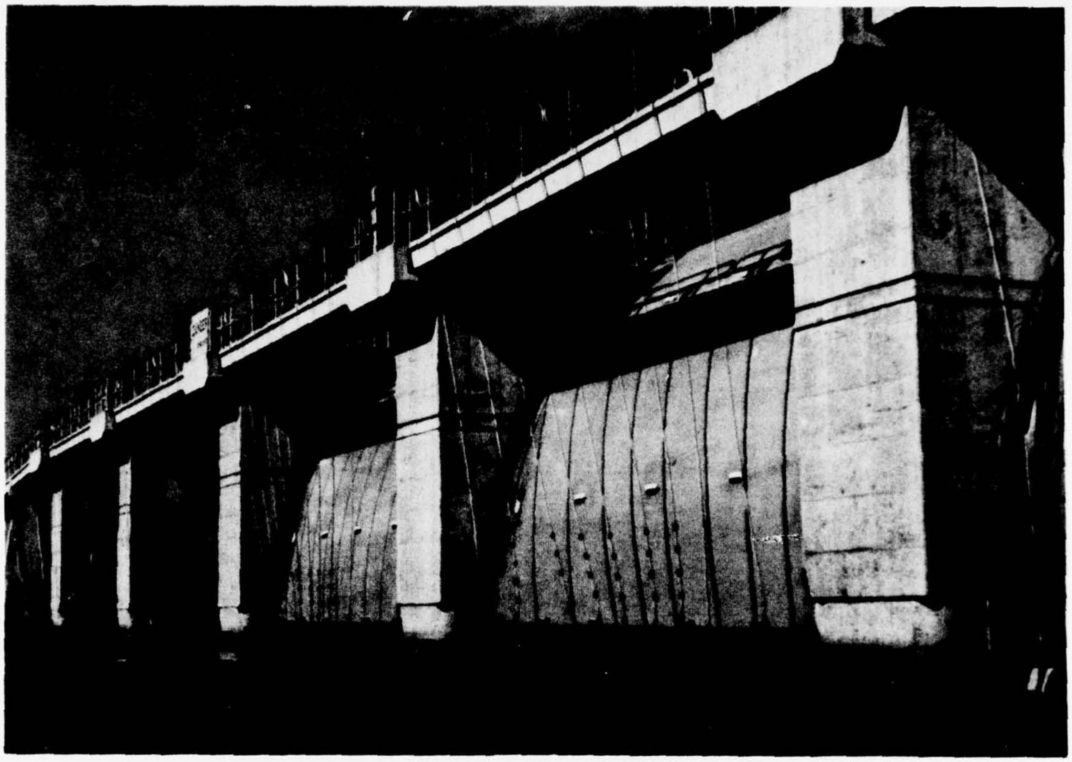
Present Status. The coastal and estuarine zone can be described as being in a current state of general deterioration. In the last 250 years, the construction of works to control devastating floods and to provide for dependable navigation has increasingly restricted the overflow of the Mississippi River, thereby depriving the zone of nourishing sediments. Through natural subsidence and erosion, the zone is yielding to the sea a part of the sediments deposited by repeated

Table 78 - Peak Load Demands for Electric Power, Lower Mississippi Region

WRPA 1/	Year	National Income Program (Megawatts)	Regional Development Program (Megawatts)
2	1970	592	592
	1980	1,023	1,099
	2000	2,936	3,288
	2020	5,013	5,815
3	1970	2,597	2,597
	1980	4,009	4,402
	2000	7,442	8,462
	2020	13,461	15,628
4	1970	701	701
	1980	1,220	1,331
	2000	4,253	4,823
	2020	7,301	8,294
5	1970	2,573	2,573
	1980	4,595	4,884
	2000	13,440	15,241
	2020	22,991	26,163
6	1970	453	453
	1980	943	1,006
	2000	2,527	2,653
	2020	4,284	4,704
7	1970	364	364
	1980	723	799
	2000	1,816	2,114
	2020	3,089	3,618
8	1970	2,090	2,090
	1980	4,221	4,550
	2000	14,398	16,126
	2020	25,235	28,642
9	1970	1,256	1,256
	1980	2,600	2,782
	2000	7,900	8,943
	2020	13,300	14,949
10	1970	4,428	4,428
	1980	8,158	8,802
	2000	21,863	24,377
	2020	36,859	41,835
Region	1970	15,054	15,054
	1980	27,492	29,655
	2000	76,575	86,027
	2020	131,533	149,648

1/ Capacity and energy for any WRPA may be associated with WRPA 1.

overflow during centuries of time. The zone is also undergoing change from man-made canals built in connection with development of the petroleum and fishing industries. These canals not only provide avenues for the intrusion of saltwater, but their bank lines are subject to wave attack. All together, man-made changes are altering the basic character of the coastal and estuarine zone, particularly in the productivity of fish and wildlife.



Rice-growing lands above Lake Charles, Louisiana, are protected from salt-water intrusion by the Calcasieu River Salt-Water Barrier.

Future Needs. Needs in the coastal and estuarine zone were developed within limitations of data collected largely for other purposes. Satisfaction of stated needs will enhance the productivity of fish and wildlife in the zone by maintenance of adequate salinity conditions and management of water levels. Providing required Mississippi River flows will also enhance the physical condition of the zone itself by preventing shore erosion and reducing land losses. Since a condition as close to equilibrium as possible is the objective in the estuarine zone, needs are identical for all time frames and study objectives.

(1) Land Building Needs - The source of material for land building in the coastal zone has been sediment transported by the Mississippi River and its distributaries. Now confined by levees, however, the Mississippi River discharges most of its transported sediment into the deep water of the Gulf of Mexico. An estimated 16.5 square miles of marshland in the coastal and estuarine zone are being lost each year from the combined effects of subsidence, erosion, compaction, organic decay, and the various works of man.

The relationship between river flow and sediment transport in the Mississippi River is reasonably well known. For this reason, as well as to facilitate resource allocation in compatible terms, the need for land building is expressed in Appendix O, Coastal and Estuarine, in terms of riverflow. The expressed need is for delivery of 352,200 m.g.d. of sediment laden water to strategic locations in the estuarine zone.

(2) Salinity Alteration Needs - Water salinities in the coastal and estuarine zone have been characterized by relative stability, particularly with respect to the transition from fresh to saline zones and by gradual salinity change during and after floods. However, the construction of levees and the extensive channelization of the marsh for navigation, drainage, and mineral exploration and production have provided avenues for the intrusion of saltwater, which has resulted in a long-term trend toward increased water salinities in certain areas of the marshes

Optimum conditions for commercial and sport fishes productivity in the zone can be achieved in problem areas by the maintenance during spring, summer, and fall of the 15 parts per thousand (p.p.t.) mean salinity isohaline at the location shown on figure 3, Appendix O. A second condition favoring wildlife productivity is maintenance of water salinities not exceeding 15 p.p.t. at the saline-brackish marsh contact (a line, also shown in figure 3 of Appendix O) at least 5 percent of the time. These requirements dictate supplemental water needs throughout the year in the Calcasieu Lake area in WRPA 9, and during fall and winter at several locations in WRPA 10. Overall coastal zone needs for salinity control, based on average annual requirements, are estimated at 36,900 m.g.d. Of this amount, 28,000 m.g.d., and 8,900 m.g.d., are needed in WRPA's 10 and 9, respectively. No requirements for salinity control exist in WRPA 8.

(3) Water Level Management Needs - Estuarine productivity in the coastal and estuarine zone is dependent upon a pattern of cyclical change in water levels. Supplemental flows, beyond that available from runoff, are required at two locations in the zone. In the Grand and White Lake area in WRPA 9, a minimum water level of 2 inches above the marsh floor is needed during the period August through May to promote growth of desirable plants for enhancement of wildlife productivity. In the Atchafalaya Floodway, supplemental water is needed to optimize fish and wildlife production. The requirement is equal to the optimum flow minus the minimum flow normally available. These two purposes require an average annual flow which amounts to 59,600 m.g.d.

(4) Shoreline Erosion Control Needs - For many years after the Mississippi moved to its present location, floodwaters and sediments were widely dispersed throughout the coastal zone by overbank flows of the Mississippi River through its distributaries. With the confinement of the Mississippi River and its main distributary, the Atchafalaya River, the only areas now receiving appreciable sediments are the Mississippi Delta and the Atchafalaya Bay areas. Deprived of the freshening effects of overflows, the shoreline is now eroding from the combined effects of wind, tidal action, and waves.

Five separate areas in WRPA 10, totaling 10.1 miles of shoreline, are undergoing critical erosion, and protection of these shorelines constitutes a need in the coastal and estuarine zone.

The following table summarizes the coastal and estuarine needs.

Table 79 - Summary of Needs, Coastal and Estuarine Zone, Lower Mississippi Region

WRPA	Land Building 1/ (m.g.d.)	Salinity Alteration (m.g.d.)	Water Level Management (m.g.d.)	Protection Needs (Miles)
9	14,900	8,900	59,600	0
10	337,300	28,000	0	10.1
Total	352,200	36,900	59,600	10.1

1/ The land building need for maintaining a dynamic near equilibrium in land loss-land gain in the entire coastal zone expressed in terms of Mississippi River flow is shown. The land building need for the entire zone prorated to WRPA's based on land loss in individual WRPA's is also shown.

Archeology and History

Present Status - Archeology. Archeologists have found convincing evidence that man has lived throughout the Lower Mississippi Region for thousands of years. The total number of sites of his occupancy are unknown, but more than 5,000 sites have been recorded to date and are believed to represent but a small fraction of the total. Sufficient archeological work has been done on 64 percent of the recorded sites to provide an estimate of the total number of sites of man's occupancy, and to roughly place the sequence of his cultural and temporal development in the region. Some 100 sites have been excavated but less than one dozen have been extensively investigated.

Present Status - History. As of 1970 there were 237 historic sites within the confines of the Lower Mississippi Region recognized as significant from a historical standpoint. The listing includes battlegrounds, historic dwelling places, legendary sites, natural landscape features, roads, trails, waterways, cemeteries, machines and man-made structures, cultural sites and festivals, and those archeological sites listed on the National Register of Historic Places. Sites listed on the Register or designated as National Historic Landmarks numbered 176 in 1970, and an additional 61 were recognized as historic assets by States of the region. Inventory surveys conducted during 1973 catalogued an additional 2,171 significant historic sites regionwide. Table 80 gives a WRPA resume of the status of recognized regional historic sites as of 1973.

Table 80 - Regional Historic Resources, 1973, Lower Mississippi Region

WRPA	Number of Sites		
	Total Inventoried	Total Mapped	Total on National Register1/
2	611	41	28 (14)
3	188	24	17 (3)
4	272	27	26 (6)
5	396	28	12 (0)
6	71	6	1 (1)
7	407	32	29 (7)
8	266	24	18 (0)
9	86	20	11 (1)
10	111	35	34 (1)
LMR	2,408	237	176 (33)

1/ Number in parentheses indicates archeological sites included in Register listing.

D'Evereux, in Natchez, Mississippi, is but one example of the many lovely antebellum mansions in the region.

Future Needs - Archeology. Although archeologists are able to make informed estimates of man's historic activities in the region, huge knowledge gaps exist on specifics of cultural and temporal sequences and the geographical extent of his occupancy. There is no area in the region that is considered well known archeologically at this time, considering the kinds and amounts of work required to satisfactorily describe the history of other areas in the country which have received extensive attention. Consequently, future needs are heavily oriented to completion of extensive surveys of archeological sites by 1980 with highest priorities on the survey of sites threatened by development activities. Table 81 displays needs for the years 1980 and 2000. The 2020 time frame is omitted because there is no way to predict work required beyond the year 2000 until the results of needed surveys are analyzed.

Future Needs - History. The region's most pressing historical resource need is to accurately determine through comprehensive survey the total number of significant historical sites in existence in the region. Those sites which, after cursory examination, appear to possess

Table 81 - Future Archeological Needs, Lower Mississippi Region

Area	Need Category	Time Frame By 1980	By 2000
WRPA 1			
	Included in adjacent WRPA totals		
WRPA 2			
8-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	74	322
	Sites Excavated	18	76
WRPA 3			
5-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	45	201
	Sites Excavated	10	45
WRPA 4			
6 1/2-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	61	261
	Sites Excavated	14	58
WRPA 5			
10-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	90	390
	Sites Excavated	21	90
WRPA 6			
2-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	20	81
	Sites Excavated	4	18
WRPA 7			
3-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	28	120
	Sites Excavated	6	27
WRPA 8			
3-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	27	121
	Sites Excavated	6	28
WRPA 9			
6-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	54	234
	Sites Excavated	12	54
WRPA 10			
3-2000 sq mi	Intensive Survey	Complete	--
Unit	Sites Tested	27	118
	Sites Excavated	6	29
Region			
48 Units of	Intensive Survey	Complete	
2000 sq mi	Sites Tested	426	1,848
	Sites Excavated	97	425

attributes of significant value should be placed on a National or State Register to insure their integrity until further investigation can prove their merits or cause their subsequent removal from the register. This intensive survey should be completed by 1980.

Future needs were categorized by State Historians as those sites worthy of structural restoration; those which should be placed on registers as special district, structures or sites; historic roads or trails; and cemeteries. A number of interpretive markers are also recommended to explain to residents and tourists the significance of various historic resources. Historic structures are man-made structures such as an old court house, plantation, or bridge; historic districts refer to areas of the region where significant pages in the story were written, such as the Beale Street section in Memphis or the city of Vicksburg, headquarters for southern troops during the Civil War; historic sites are specific locations where history was made, such as Davy Crockett's cabin in Tennessee; historic markers serve to tell the story to residents and visitors; and roads, trails, and cemeteries are self-explanatory.

It should be recognized that when specific numbers are attached to need categories prior to completion of comprehensive surveys, they are subject to change which in some instances might be drastic. Nevertheless, such an endeavor serves to form a basis for the program measures which are included in the recommended program and although highly judgmental are essential to formulation of a comprehensive program. Future historical needs are displayed in table 82.

Health Aspects.

Present Status. Water often carries pathogenic, or disease causing, organisms. Consumption of such water has led to serious epidemics in past years and can still do so. Although there have been no widespread epidemics in recent history in the region, there continues to be a significant incidence of waterborne disease. In the period 1960 through 1970 over 24,000 cases of waterborne-type disease were recorded, 8 percent of all reported cases in the United States. The potential for catastrophic epidemics remains a constant threat. Chronic illnesses which may result from use of water containing certain chemicals, such as mercury, have also become a matter of concern in recent years.

In general, drinking water supplies of the region are of good quality and require little treatment. There are constant dangers to some surface supplies however, the most significant ones being municipal waste discharges, agricultural runoff, and toxic material spills. A constant surveillance of drinking water supplies must be maintained.

Water, in addition to carrying disease organisms, often provides the breeding environment for insects which carry and transmit disease. There were over 3,000 reported cases of vector-borne diseases, including malaria, encephalitis, and others in the 1960-1970 period.

Table 82 - Future Historical Needs, Lower Mississippi Region

WRPA	National or State Register of Historic Places[1/] Structures 1980	2000	2020	Districts 1980	2000	2020	Sites 1980	2000	2020	Restoration Of Structures 1980	2000	2020	Roads & Trails 1980	2000	2020	Cemeteries 1980	2000	2020	Interpretive Markers 1980	2000	2020
2	140	270	345	3	4	3	102	122	142	35	90	115	8	7	6	1	1	1	35	50	50
3	1115	403	722	9	11	16	80	33	27	45	70	90	3	16	4	45	65	58	82	145	152
4	35	100	220	2	2	1	50	12	2	12	45	100	4	2	0	20	75	20	10	50	150
5	150	250	325	4	2	2	151	171	152	75	131	154	3	3	4	0	2	0	80	190	300
6	18	31	32	1	1	0	11	16	26	21	10	15	0	1	2	0	1	1	34	124	204
7	100	100	100	4	10	25	50	20	15	20	10	15	5	7	10	25	50	75	50	75	90
8	55	110	88	2	4	6	8	19	5	28	56	58	3	4	3	6	13	12	35	140	235
9	70	100	200	2	4	2	0	0	0	15	32	23	0	2	1	2	2	0	30	130	230
10	300	2900	1075	1	2	2	2	0	0	268	2730	4200	0	2	1	1	2	0	36	156	276
LMR	1983	4264	3107	28	40	57	454	393	369	519	3174	4770	26	44	31	100	211	167	392	1060	1687

1/ Resources in subcategories listed hereunder should be added to National or State Register of Historic Places in timeframes indicated until further investigation can verify or disclaim their merits as significant historic resources.

Tremendous strides have been made in control of vector-borne diseases through water resource developments and pesticide application. The region once contained great areas of swampland. Floods occurred over vast areas, leaving thousands of pools which were an ideal breeding ground for mosquitos and other disease transmitting insects. Malaria and yellow fever were major public health problems up until the early forties. Water resources development in the form of flood control and drainage, and application of controversial DDT are directly responsible for the reduction in vector problems in the region.

Natural swamps, sluggish streams, lake margins, salt marshes, and residual ponding from periodic major floods, along with irrigated rice fields in southwestern Louisiana and the Grand Prairie of Arkansas, are the sources of most of the remaining vector-borne disease problems in the region.

Future Needs. Regional health needs are centered around continued surveillance and treatment of public drinking water supplies, elimination of disease-related surface water pollution, provision of adequate public sanitation facilities in high density water oriented recreation areas, and institution of comprehensive vector control programs. Table 83 summarizes regional needs by State.

Table 83 - Summary of Future Health Aspects Needs, Lower Mississippi Region

State	Year	Category of Need	Number 1/
Arkansas	1980	State Drinking Water Program	1
	1980	Vector Abatement Districts	9
	2000	Vector Abatement Districts	16
Kentucky	1980	State Drinking Water Program	1
Louisiana	1980	State Drinking Water Program	1
	1980	Vector Abatement Districts	30
	2000	Vector Abatement Districts	32
Mississippi	1980	State Drinking Water Program	1
	1980	Vector Abatement Districts	10
	2000	Vector Abatement Districts	16
Missouri	1980	State Drinking Water Program	1
Tennessee	1980	State Drinking Water Program	1
	1980	Vector Abatement Districts	1
	2000	Vector Abatement Districts	3

1/ Total number of districts to be operating by specified year.

ALTERNATIVES

General

One of the preliminary steps in formulating water and related land resource plans and programs was to identify and array a wide range of solutions to the region's water and related land resource problems and needs. Alternative solutions were then investigated to the degree necessary to make a reasonable decision on their practicability, based on available information and the judgment of professional planners. Accordingly, some alternatives received only superficial consideration, whereas others were investigated in depth. For instance, effluent component reclamation as a water quality alternative was given only cursory examination because the state of the art has not progressed to the point where this alternative can be evaluated on an equal footing with other options. Conversely, the tried and proven alternative of conventional waste treatment for water quality control was given heavy consideration. A listing of all options considered as possible solutions to the region's problems related to water and land resources is given in table 84.

Screening of Alternatives

In the screening alternatives, a few were eliminated because of legal or political considerations, some were discarded on the basis of financial constraints, and others were set aside due to a lack of public acceptance or a paucity of information. Some screening was done in making basic assumptions preliminary to or during the analysis leading to compilation of certain appendixes, as in navigation. Table 82 may appear incomplete for this reason. The reader is referred to the individual appendixes in such cases. As a particular example of how the screening process was carried out, consider water supply. Inasmuch as the region possesses an ample supply of whater which generally requires only good management to satisfy all needs, the serious investigation of only a limited number of conventional alternatives was necessary. However, should compacts be perfected allowing for diversion of significant quantities of water out of the region, such as to the High Plains of Texas and New Mexico, a more stringent investigation of other listed alternatives, such as weather modification, rationing, desalination, or recycling, may become necessary.

More intensive resources management is also conspicuously absent from table 84. The reason for this is because resource needs presented in the separate appendixes are not all expressed in terms of equal management efficiency. Using such needs without adjustment would result in an inefficient allocation of the region's resource base because needs controlled by a range of management levels would be competing on equal footing for the resource base. In order to alleviate this problem, all needs were reduced to compatible, common management levels before resource allocation was begun. The previous section contains a detailed discussion of how needs were so scaled.

Table 84 - Potential Solutions to Resource Problems and Needs, Lower Mississippi Region

Resource Requirement	Potential Solutions
Water	
Withdrawals	
Municipal	Surface Water Development[1/]
Industrial	Additional Surface Storage
Rural Domestic	Ground Water Development
Irrigation	Ground Water Recharge
Livestock and Poultry	Inter-region Diversion
Minerals	Intra-region Diversion
Thermoelectric Power	Water Salvage[2/]
Commercial Fishing	Desalinization
Fish and Wildlife	Weather Modification
Coastal and Estuarine	Water Conservation[3/]
Surface Area	
Recreation	Lake and Pond Construction
Fish and Wildlife (Sport Fishing)	Raise Existing Lake Levels
Environmental	Access Development
	Facilities Development
Land Area	
Cropland	Conversion of Land-Use
Pasture	Purchase
Other Agriculture	Easements
Forest Land	Land-Use Regulation
Urban and Built-up	Subsidy
Recreation	Purchase and Re-sell
Fish and Wildlife	Access Development
Minerals	Facility Development
Commercial Fishing (Catfish & Crawfish)	
Environmental	
Water and Land Resource Related Problems	
Flood Damage	Reservoir Storage
	Channelization
	Levees and Floodwalls
	Pumping Plants
	Channel Stabilization

Table 84 - Potential Solutions to Resource Problems and Needs, Lower Mississippi Region (Cont'd)

Resource Requirement	Potential Solutions
Water and Land Resource Related Problems (cont'd)	
	Zoning and Regulation Warning and Evacuation Flood Proofing Watershed Land Treatment Diversion of Flood Flows Flood Insurance
Sediment and Erosion	Bank Stabilization Sediment Control Structures 4/ Watershed Management 5/ Revegetation
Excessive Wetness	On-Farm Drains Channelization Watershed Management 6/
Water Quality	
5-Day BOD Bacteria Thermal Oil and Grease Toxics Turbidity Heavy Metals Foam Phenols Dyes Ammonia Sulfite Waste Liquors Pickling Liquors Iron Inorganic Compounds	Secondary Waste Treatment Advanced Waste Treatment Underground Disposal Assimilation 7/ Mechanical Reaeration Effluent Component Reclamation Increased Industrial Efficiency Control of Sediment and Erosion Disinfection Sprinkler Irrigation Lagooning Incineration Cooling Towers and Cooling Ponds Pesticide Control Fertilizer Management Program Land Spreading

Table 84 - Potential Solutions to Resource Problems and Needs, Lower Mississippi Region (Cont'd)

Resource Requirement	Potential Solutions
Water and Land Resource Related Problems (cont'd)	
Navigation	Canelization (Locks and Dams) Shallow-Draft Channels Deep-Draft Channels Locks Ports and Wharves (Harbors) Superport
Recreation, Fish and Wildlife	Access Development Facilities Development
Hydroelectric Power	Run-of-River Plants Reservoirs
Coastal and Estuarine	Locks, Salinity Control Structures, and related levees and channels for water diversion Spillway Gate Modification for water diversion Bank Stabilization
Aesthetics	8/
Archeological Historical Unique Biological Systems Unique Botanical Systems Unique Ecological Systems Unique Geological Systems Scenic Rivers and Streams Lakes Wilderness Areas Urban-Oriented Open and Green Space Bottom-land Hardwoods Beaches and Shores Wetlands	Purchase Easement Purchase and Re-sell Subsidy Land-Use Regulation
Health Aspects	Water Quality Improvement Vector Control Emergency Preparedness

Table 84 - Potential Solutions to Resource Problems and Needs, Lower Mississippi Region (Cont'd)

1/ Development of existing surface waters without additional storage.
2/ Reclamation and re-use of treated wastewater
3/ Reduced water use through metering and pricing, development control, rationing, public education, facilities repair or replacement, elimination of wasteful uses, evaporation reduction, and increading irrigation efficiency and cropping so as to reduce water requirements for a given level of production.
4/ Contour farming, ditch checks, and reservoirs (Physical Measures).
5/ Non-physical land treatment measures such as changing cropping patterns, changing land use or improving existing practices.
6/ Includes all land treatment measures, as changing cropping patterns, which will facilitate use of lands with high wetness.
7/ Includes diversion of wasteload to stream, diversion of stream to wasteload, releases from reservoir storage, and natural assimilative capacity of streams.
8/ All options for satisfaction of aesthetic needs are aimed at preservation, enhancement, restoration, creation, or otherwise managing the region's aesthetic resources for the enjoyment of future generations.

In this appendix land treatment is not handled as a category of need, but rather as an alternative to alleviation of problems of flooding, excessive wetness, and sediment and erosion. In formulating the various plans and programs, land treatment is freely employed as an alternative to allow optimum utilization of the region's land base. Data regarding the extent to which it was utilized in solving the abovementioned problems can be found in a later section dealing with the framework program (pages 213 to 456).

Land treatment is nearly always used in conjunction with the primary agricultural land categories of cropland, pastureland, and forest land. Table 85 lists all alternative land treatment measures considered in the formulation.

Water Supply

The region's water resources, either by virtue of supplies generated in-basin or from inflows into the region, are ample to satisfy all foreseeable requirements after considering maximum possible depletions in upstream or adjacent regions. Therefore, the more exotic water supply alternatives of water salvage, desalination, weather modification, and water conservation received little or no consideration after the initial screening of potential solutions. Distributional inequities that exist can best be satisfied by using the more conventional options of surface water development, additional reservoir storage, ground-water development, intra-regional diversion, or inter-regional diversion,

Table 85 - Land Treatment Measures, Lower Mississippi Region

Land Use	Alternative Measures
Cropland	Residue and annual cover
	Sod in rotation
	Contouring
	Stripping, terracing, or diversions
	Permanent cover 1/
	Drainage systems
	Irrigation water management 2/
Pasture land	Protection from over-grazing
	Plant cover improvement
	Brush control
	Reestablishment of plant cover
	Land use changes
Forest land	Establishment of timber stands
	Improvement of timber stands
	Forage improvement and management
	Reduction or elimination of grazing
	Fire protection
	Insect protection
	Disease protection

1/ Changing from cropland to permanent grass or forest.

2/ Improved management practices on lands being irrigated.

as in the case of an already perfected compact between the States of Texas and Louisiana. This anticipated diversion will probably be required by the year 2000 to allay serious water shortages in the Lake Charles, Louisiana, area. Ground-water development in the Lake Charles area is already to the point where extensive aquifer drawdown is occurring, and saltwater intrusion is expected to be an ever-increasing problem. This inter-regional water diversion is considered the most economical solution to this problem because the Sabine River along the Louisiana-Texas State line is a water supply source nearer to the point of need than is water from the next closest regional source, the Atchafalaya River.

Water Surface Area

Water surface area needs involve maintaining existing water areas for wildlife propagation or sport fishing, and the creation of water surfaces for outdoor recreation pursuits such as swimming, boating, and water skiing. Existing shallow water fish and wildlife areas can be maintained with relative ease since adequate ground or surface water supplies generally exist in economic proximity to points of need throughout the study area. Diversions from these water sources were retained as viable alternatives after the initial screening process.

Two alternatives considered for creation of additional water surface areas for recreation were (1) raising existing lake levels, and (2) constructing new impoundments. The first alternative was viewed as having only minimal application because of the nature of the recreation need (swimming, boating, and water skiing) and its location in the region. Because of topographic considerations, additional surface areas generally cannot be economically attained by this method, either because the depth to land area flooded ratio is excessively small or because the ratio of increased depth to new water surface area gained is excessively large. For these reasons, creation of new reservoirs was normally viewed as the most viable alternative for satisfying projected needs for recreation water surface areas.

Land Area

Land use needs, reflecting compatible management levels, were matched to resource capability on a priority basis. (See Plan Formulation Rationale and Methodology, page 195.) Formulated land-use conversions conformed to adopted priorities. All listed alternatives other than land-use conversions and purchase and resell were viewed as viable for satisfaction of needs providing lower priority uses remain multiple-use with land uses having higher priority.

Related Problems

Flood Damage Reduction. All listed alternatives for flood damage reduction were considered appropriate and were retained for possible application in specific locations throughout the region. Zoning, regulation, and flood proofing were not viewed as viable alternatives for reducing agricultural (crop and pasture) flood damages.

They were, however, viewed as appropriate and viable measures for mitigating urban damages, wherever such damages occur in the region.

Sediment and Erosion. All listed alternatives were retained for further consideration and possible application for control of this problem.

Water Quality. Appendix L, Water Quality and Pollution, presents quantified needs relative to biodegradable and bacterial pollutants. Nonorganic wastes are described only in very general terms because of their complexity, their variable composition industry by industry, and because of a paucity of information regarding their quantification. Thus, the alternatives listed in table 82 for satisfaction of non-BOD_5 pollutant needs were screened to eliminate all but heat assimilation devices, such as cooling towers and cooling ponds, already in use in the region. After screening, waste treatment, assimilation, mechanical reaeration, disinfection, lagooning, and land spreading were retained as alternatives for further consideration in satisfying biodegradable and bacterial pollutant needs. Control of sediment and erosion was retained as a means of reducing suspended matter.

Effluent Component Reclamation has been used with success in various parts of the United States. Examples are (1) spray irrigation of agricultural land with sewage treatment plant effluent, and (2) industrial re-use of waste waters from petrochemical processes. This type of wastewater management is in its infancy, however, and quantitative decision making data is almost nonexistent. Establishing suitable generalized cost curves for effluent component reclamation is beyond the scope of this study. This alternative was eliminated in the initial screening for these reasons. Underground disposal was not considered a reliable alternative because it does not apply to organic waste, it is illegal in some States, and its costs are excessive in other limited applications.

Dilution by diversion of streamflow to waste loads was found to be an expensive alternative because high pumping costs were encountered in many of its possible applications. However, it was found to be a viable solution in a few instances.

The reverse procedure, dilution by diversion of the waste load to the streams, was found to be expensive if the distance exceeded 5 miles.

Natural assimilative capacity of the region's streams was considered to have no cost; however, stream standards were considered in imposing limitations on this alternative.

Mechanical reaeration of streamflow to increase oxidation of waste was considered a viable alternative only after effluent treatment.

Dilution by release of water from impoundments was considered feasible only when multi-use could be made of a reservoir.

Secondary treatment was considered to be the minimum acceptable level of treatment. For purposes of this study, secondary treatment was defined as 90 percent BOD_5 removal for municipal systems and 96 percent BOD_5 removal for industrial systems. At those locations where the expected waste loading with secondary treatment degrades stream water quality below State water quality standards, the alternative of advanced waste treatment was used. This level of treatment was defined as 98 percent BOD_5 removal for both municipal and industrial wastes.

Bacteria control in water is accomplished by disinfection which may be obtained by several methods, including:

(1) Chlorine

(2) Iodine

(3) Bromine

(4) Ozone

(5) Potassium Permanganate

(6) Hydrogen Peroxide

(7) Heat

(8) Light

(9) Metal Ions

(10) Alkalis and Acids

(11) Surface-Active Chemicals

Only chlorination has been used in the United States since 1890. It is now widely accepted and employed in a vast majority of existing treatment facilities, and is the only method listed that is both efficient and inexpensive. Therefore, chlorination is the chosen alternative. Its beneficial side effects include:

(1) The control of undesirable growths such as algae.

(2) Improvement of coagulation and grease separation.

(3) Control of odors in water and sludge.

(4) Prevention of anaerobic conditions in collection and treatment facilities.

(5) Conversion of cyanides to cyanates in alkaline waste.

(6) Destruction of hydrogen sulfide, thus offering protection against corrosion.

(7) Reduction of immediate oxygen requirements of returned activated sludge and of digested liquor.

(8) Reduction of BOD of waste water.

In spite of insufficient quantitative data on the discharge of non-BOD_5 pollutants, a general assessment was made of the region's total water pollution problem. This was considered an absolute necessity due to the conviction of the plan formulators that non-BOD_5 pollutants are apt to pose by far the greatest threat to future water quality in the Lower Mississippi Region. In this context some of the other water quality alternatives presented in table 84 are discussed in the narrative covering the recommended plan.

Navigation. Alternative modes of cargo movement were considered beyond the scope of a Type 1 study in the preparation of Appendix J, Navigation. It was assumed instead that the quantified tonnages, based on historical trends and expert opinion, represented those which would move only by water transport in the future. Then it became a matter simply of determining which development configuration, composed of some combination of the listed alternative measures, could most efficiently move the predetermined amount of cargo.

Hydropower. The run-of-the-river option for hydropower generation was investigated in detail as part of the "West Texas and Eastern New Mexico Water Import Study" and was found to be infeasible as an alternative means of generating power because of a lack of suitable sites for such power generation within the study area. This option was therefore dropped during screening, leaving reservoir construction as the only viable means of increasing the region's hydropower output.

Coastal and Estuarine. All listed alternatives were considered appropriate and were retained after initial screening for possible application at specific locations in the coastal zone.

Aesthetics - (Archeology, History and Natural Environment). All listed options for maintaining and enhancing the aesthetic qualities of the region except purchase and resell were retained after initial screening. Purchasing of significant aesthetic areas was considered only to the extent that such areas could not otherwise be preserved or maintained under the multiple-use concept. Land-use regulation was viewed as a good alternative only in areas marginally likely to change status without some preventive action.

Health Aspects. Satisfaction of any or all the requirements of the Water Quality Act Amendments of 1972 results in satisfaction of some portion of the region's health needs. Water quality can be improved through treatment of water supplies and treatment of wastes. Disinfection

with chlorine or another suitable chemical for bacteria control is the recommended program alternative, not only for the reason stated earlier, but also because of its significance as a health measure. Vector abatement programs and emergency preparedness programs are also considered viable alternative ways in which the health of the region's residents can be safeguarded and improved.

PLAN FORMULATION

RATIONALE AND METHODOLOGY

GENERAL

In this study, plan formulation is directed to three broad planning objectives: National Income, Regional Development, and Environmental Quality. The formulation philosophy required that a physically, economically, and socially feasible alternative framework program be developed for each objective within legal and institutional limitations. Hence, each program is flexible enough to allow decision-makers a wide range of alternatives from which to choose. Each single-objective program, such as National Income, is fully responsive to its primary objective without neglecting the other two objectives. Programs for the different objectives are thus quite similar in content. The recommended multi-objective program adheres to the same fundamental philosophy as the single-objective programs with one major difference - it also contains elements most desired by the public insofar as those desires could be interpreted.

The general steps followed in developing alternate single-objective programs and the recommended framework program are summarized in the following five basic steps:

Step 1. Analyze resource demands and problems in light of resource availability, determine needs based on compatible levels of resource management, and categorize needs by resource type and use. When two or more demands for the same resource are competitive, set priorities; when complementary, account for multi-use.

Step 2. Identify alternative solutions to needs and problems, conduct a preliminary screening, and apply the least-cost single-purpose solution to the highest priority need.

Step 3. Identify viable and efficient multipurpose solutions, and modify single-purpose plans accordingly.

Step 4. Review plans defined to this point, account for all additional constraints, resolve conflicts, and blend into single-objective programs.

Step 5. Assess and discuss the impacts of major program components, such as flood control, on other components of the programs.

Step 6. Combine single-objective programs into the recommended multiple-objective regional framework program, adjust after impact analysis, and develop a schedule for implementation.

In the formulation process outlined above, all demands on a given resource are identified regardless of the concerned private or public entity or the investment-management requirements for needs satisfaction. This allows a complete and impartial comparison of needs with a resource and provides a true assessment of the adequacy of that resource. However, only those needs satisfaction measures which fall within the purview of the public sector are translated into the costed program. The total program includes private sector management options which are assumed to materialize by time frame so that the land and water area allocations will satisfy needs in an efficient manner. Public sector costs are broken into Federal and non-Federal costs. Non-Federal costs do not account for private investment required in meeting future needs associated with the private sector.

Resource needs or problems were identified and plans formulated on a WRPA basis, except where practical to work with smaller geographical delineations such as river basins, county groupings, and other areas of lesser scope within WRPA's. The smaller area plans and WRPA plans were then integrated with allowances for intra-planning area needs satisfaction to form the regional programs to meet needs in the target years 1980, 2000, and 2020. Regional planning took into consideration the external influences that development of a planning area's resources may have on adjacent physical systems, including ground-water resources, streamflows, water quality, and the natural environment. It also took into consideration the interrelationship of socioeconomic influences among planning areas. Among the most obvious of these influences is the relationship between WRPA 1 (Mississippi River) and the other WRPA's. Economic growth in some WRPA's has been largely dependent upon the enormous water supply and transportation system afforded by the Mississippi River, and the ability of man to control the devastating floods and meandering of the river and its tributaries. Although the interrelationships between most WRPA's are not as pronounced as those between the Mississippi River and directly adjacent WRPA's, consideration of these factors was nonetheless essential to development of the regional framework program.

Special facets of plan formulation, including deviations in the described rationale and general methodology, are presented in the following paragraphs along with a more detailed description of methods used by resource need group and problem category.

SINGLE-OBJECTIVE PROGRAMS - UNIQUE FEATURES

National Income Program

Plan formulation for the National Income Objective involved development of a regional program to meet needs associated with one set of projections for economic and demographic growth in the Nation. The target level of growth, referred to as Program A in Appendix B, Economics, is that which can reasonably be expected in light of historical growth trends of the region relative to national growth trends. Thus, implementation of a program responsive to those growth levels should not represent a disproportionate share of regional investment by the Federal Government at the expense of other regions in the Nation, provided historic investment levels continue.

After plans were formulated to meet specifically defined National Income needs, such as municipal water supply, natural environmental quality components were added to enhance the plan.

Regional Development Program

This program is keyed to an exclusive set of regional projections for economic and demographic growth. The regional development projections parallel those in the National Income set, except that regional growth is accelerated to approximately equal the average national rate of growth. Viewed within the constraints imposed by a limited national budget, this program would require a disproportionate share of investment relative to that in other regions. Natural environmental quality components were again added to the basic plan to make it more comprehensive.

Environmental Quality Program

A radical departure from normal plan formulation methodology was required to be responsive to this objective. A comprehensive listing of natural environmental components was first developed for each planning area. Initially conceived by environmental specialists, these lists were expanded and modified by the States and the plan formulators, and adopted as the nucleus of the plan. The level of economic development chosen by environmental specialists as the most desirable in keeping with the environmental objective was the same as that projected for the National Income Objective. Accordingly, National Income Objective needs for basic resource use and control categories, such as municipal and industrial water supply, were adopted as the Environmental Quality Objective needs for those water-use categories. Environmental quality plans were then formulated in a like manner for other objectives, with two notable exceptions: (1) the emphasis and priorities were shifted to the natural environmental quality of the region, and (2) in the case of water quality, tertiary treatment of wastes by 1980 was required in lieu of the less stringent secondary treatment required under the National Income and Regional Development water-quality programs.

WATER WITHDRAWAL BALANCE AND PLAN DEVELOPMENT

General

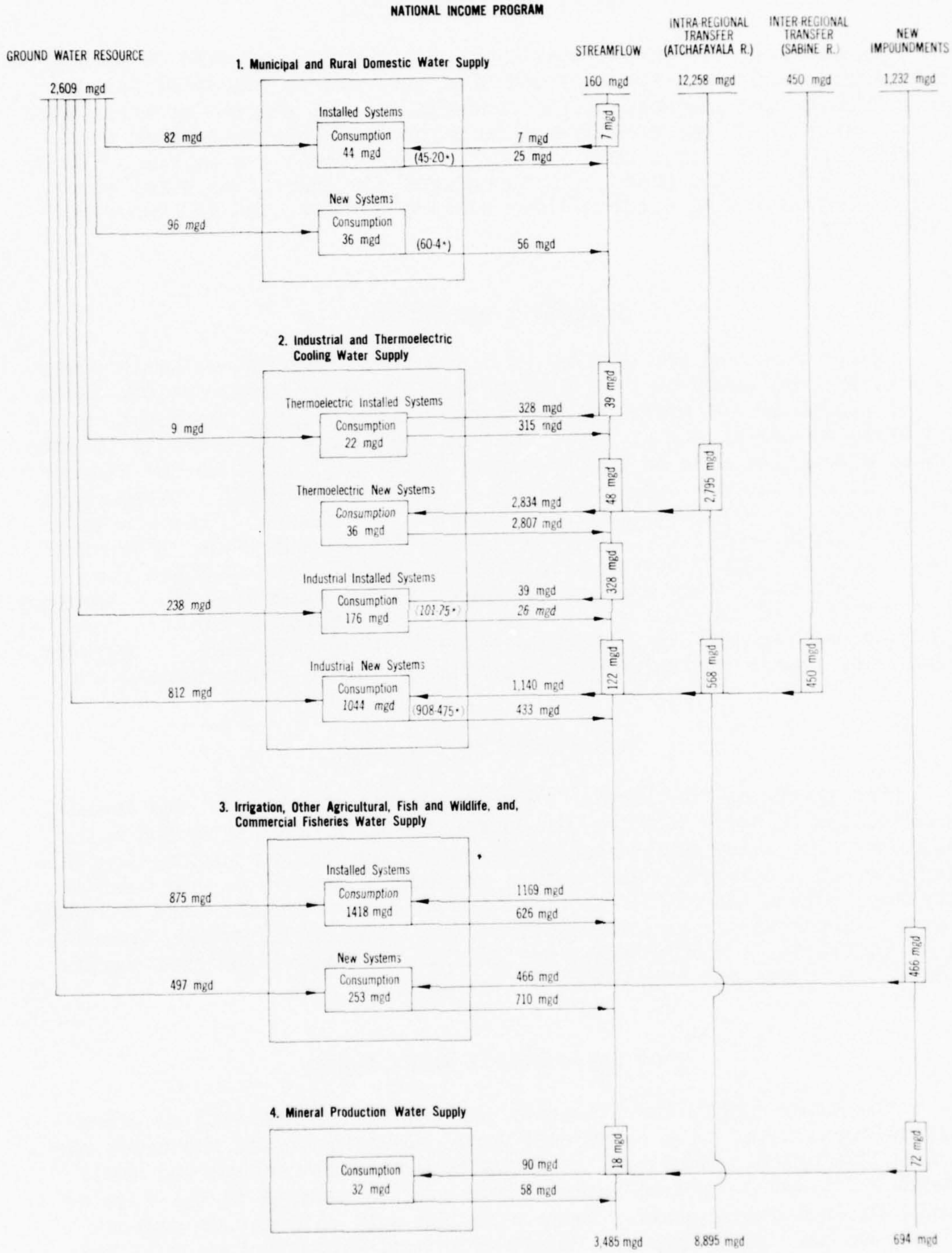
The primary rationale employed in formulation of a plan to meet water withdrawal requirements dictated that the highest priority need be fully satisfied at the cheapest cost, with each successively lower priority need being satisfied by the remaining cheapest source(s), until all needs were satisfied or until the available resource was exhausted. In order to translate this rationale into a workable plan, alternative sources (ground water, streamflow, or surface storage) were identified and a rough unit cost of withdrawal from each source was estimated. The costs were generally unit annual equivalent amounts that included annual treatment (quality), operation, and maintenance. These costs were used because the initial investment costs of some alternatives were misleading. Priorities were established for each category of water use and the highest priority use was assigned the cheapest source of water. These priorities closely parallel those for land because of the distinct interrelationship between the utilization of water and land (see pages 203 to 207 for a discussion of land use priorities).

In the water balance, each withdrawal was reduced by the amount of consumptive use and the net return flow was added to the low streamflow so that an accounting of the remaining water resource was available for the next category of need. The water balance is schematically represented in figure 15. Where streamflow was considered as an applicable alternative water source, the maximum flow considered available for municipal, rural domestic, industrial, and thermal cooling uses was generally limited to the one in 30-year, 7-day low flow. For all other uses a less stringent failure criteria, the one in 10-year, 7-day low flow, was generally adopted. The WRPA's were divided into water balance subareas so that localized problems could be better identified. Water supply plans were developed utilizing alternative sources and measures as single use only. These plans were then refined for incorporation of more efficient, multi-use measures. There were adequate water resources within the region to meet future needs, although in one instance it proved to be cheaper to import water under the terms of an existing compact than to divert water intraregionally.

Municipal Water Supply

Municipal water supply was assigned highest priority for needs satisfaction from the available water resource. Alternative sources were ground water, streamflow, and surface storage with selection by least cost solution method. Costs of ground water included well and well pump costs and treatment plant costs. Streamflow diversion costs included the costs of reservoirs, intake, pumping plants, pipelines, and treatment plants.

YEAR 2020-WRPA 9
NATIONAL INCOME PROGRAM



* Unusable Return Flows

Lower Mississippi Region
Comprehensive Framework Study
SAMPLE WATER ALLOCATION SCHEMATIC
1970

Figure 15

Industrial Water Supply

Industrial self-supplied water is not normally an area of public investment, but needs for this use were included in the water balance to determine the adequacy of the resource and the sources of water used by industry so a source would not be unknowingly oversubscribed by a succeeding water user. Some industrial water needs can be satisfied by brackish water. The costs of alternatives for industrial water were calculated employing a methodology similar to that used for municipal water supply.

Thermal Water Supply

Water required for cooling in conventional thermal electric power plants is considered to be a private investment problem, but the needs are included in the water balance because this purpose represents a major water use in the region. Most of the future increases in thermo-power production will be met by plants located adjacent to the Mississippi River, where a large quantity of water is available. Some existing plants use surface supplies other than the river. Other plants utilize ground water coupled with cooling towers and ponds. The existing source of supply for these plants was found to be adequate for future withdrawals and was not displayed in the water balance. Adequacy and location of source, rather than costs of alternatives, were the primary determinants in allocating water to meet this need. Similarly, source of supply controlled the location of future power plants.

Irrigation Water Supply

Irrigation is the largest consumptive use of water in the region, ranks third in water withdrawals, and has a major impact in the water balance. The alternative sources of supply considered for meeting this category of need were ground water, streamflow diversion, and surface storage. Costs associated with ground-water use included well and pump costs. Costs associated with surface water included intakes, transmission facilities - either pipelines or open channels - and pump facilities. No treatment costs were estimated.

Other Agricultural Water Supply

The water supply for livestock and poultry categorized as other agricultural water is a relatively small requirement and the needs are widely dispersed. This need is normally a private concern and would probably be met by ground water and/or surface storage in the form of small on-farm stock ponds. These were the only alternative sources given serious consideration. Costs of ground water include well and pumping facilities and surface storage costs are based on a unit acre-foot cost for small farm ponds.

Commercial Fisheries Water Supply

The withdrawal of water for fish and wildlife purposes is normally for the artificial flooding of waterfowl areas. The needs represent the second largest consumptive use of water in the region. Water withdrawals for this purpose now come from both ground water and streamflow. However, all three alternative sources of water, ground water, streamflow, and surface storage were considered. The unit costs of these alternatives are the same as for commercial fisheries and do not include treatment costs.

Mineral Water Supply

The water requirements for minerals primarily consist of water used to flood oil fields, a process whereby water is induced into individual oil wells. The oil, which is the less dense of the two mediums, rises above the water, reducing pumping heads and costs; and additional oil, which the well might not normally reach, is produced. There are other less significant mineral uses of water such as gravel washing and quarrying of cut stone. The sources for mineral water use were: ground water and streamflow, which could be either brackish or fresh, and surface storage. Costs of the measures required to procure water from each of the alternate sources were calculated similarly to costs for other uses.

WATER SURFACE BALANCE AND PLAN DEVELOPMENT

Needs for water surface areas include recreation, fish and wildlife, and aesthetic purposes, or natural environmental components such as lakes of outstanding natural beauty. Multiple use of existing lakes satisfies all or portions of these needs and such multi-use is assumed to prevail throughout the period of study. When a deficit arises, additional surface may be provided. The deficit may be offset by utilization of water areas in other WRPA's, or it may go unsatisfied. A regional accounting of available and potential water surface areas was made by planning areas. Water areas which are proposed to satisfy problems relating to navigation, flood control, water supply, and hydropower were incorporated. Surpluses and deficits were noted. WRPA's with surpluses were examined to determine the extent to which they are capable of satisfying needs in another WRPA. Allocation of surpluses to satisfaction of needs elsewhere in the region was based upon general approximations and consideration of the distance and driving time separating surpluses from points of need. Alternatives considered in order to meet needed water surface areas were: (1) raising existing lake levels, (2) creating impoundments for the express purpose of satisfying water surface area needs, and (3) intensifying management of existing areas. Each alternative was checked for physical applicability and appropriateness, and the least costly alternative was selected. A constraining condition was that lakes created expressly for water surface area be included only to satisfy in-WRPA needs.

Where existing resources were capable of satisfying water surface area needs, but were not in a satisfactory ownership or control condition to contribute to needs satisfaction, appropriate alternative means of insuring such ownership or control were investigated and the least costly was utilized. Options included purchase, easements, and subsidies. Due recognition was made of the fact that in some States lake bottoms and thus the lakes themselves are already in public ownership. In such cases, only control of shorelines was needed to insure satisfaction of certain water surface area needs.

LAND USE ALLOCATION AND PLAN DEVELOPMENT

High priority land uses largely determine the character and appearance of the land resource. The admixture of these uses therefore can provide an important clue as to what the physical appearance of the region will be in future years. Primary land uses include urban and built-up, cropland, pasture, other, and forest land. They also include recreation areas and fish and wildlife management areas, and natural environmental quality components which must be treated as primary uses when viewed in terms of the Environmental Quality Objective. These components include unique ecological and botanical systems, wilderness areas, and so forth. Table 86 shows the priority ranking assigned the various categories of need by Program. The ranking was established by consensus among planning experts after careful consideration of the study objectives.

Table 86 - Land Use Priorities, Lower Mississippi Region

Use Category	Numerical Ranking Program A	Program B	Program C
Urban and Built-up	1	1	1
Recreation - Class A	2	2	2
Minerals	3	3	4
Other	4	4	5
Recreation - Class B	5	5	6
Food Products	6	6	7
Forest Products	7	7	8
Fish and Wildlife	8	8	9
Recreation - Class C	9	9	10
Natural EQ Components	10	10	3

Many of the land uses are overlapping, as in the case of cropland and pasture areas providing wildlife food and cover. Table 87 provides a listing of primary land uses and their included uses.

Land-use allocations were made in order to determine the adequacy of the land base with respect to demands upon it, and to identify the magnitude of land-use programs calling for public controls, via investments. As a first step, priorities were established within the primary land-use categories, based on expressed public preference but tempered by judgment of experienced planners. Then lands were allocated according to need, sometimes combining several compatible uses on the same lands. The allocation continued with each successively lower priority need having access to remaining lands until the resource was exhausted.

Table 87 - Primary Land Use and Multiple Uses, Lower Mississippi Region

Primary Use	Included Use
Urban and Built-up	Recreation - Class A, urban open and green space, and some mineral lands.
Cropland	Wildlife habitat for cropland edges, and some mineral lands.
Pasture	Part of recreation - Class B lands, wildlife requirements for open lands, and some mineral lands.
Forests	Wildlife habitat, recreation - Class B and C lands, some mineral lands, pastured forest, natural environmental quality compenents, watershed protection.
Water Areas	Though not readily defined as a land use, must be included in any land allocation. Uses given under section on water surface needs in this appendix.
Recreation (Class A)	Open and green space for environmental quality purposes.
Fish and Wildlife	Class C recreation, some timber production.
Natural Environmental Quality Components (exclusive use items only)	Consists of unique ecosystems, botanical systems, wilderness areas, and other defined environmental use categories.

The allocation process also considered other characteristics of land, such as agricultural productivity, habitat potential for more intensive management, etc., so that the capability of the available lands could be assessed. The allocation process is illustrated in figure 16. Alternatives and costs were not identified for all of the land-use groups. Only those that are likely to pose public investment problems required specific identification, cost comparison, and selection of alternative measures.

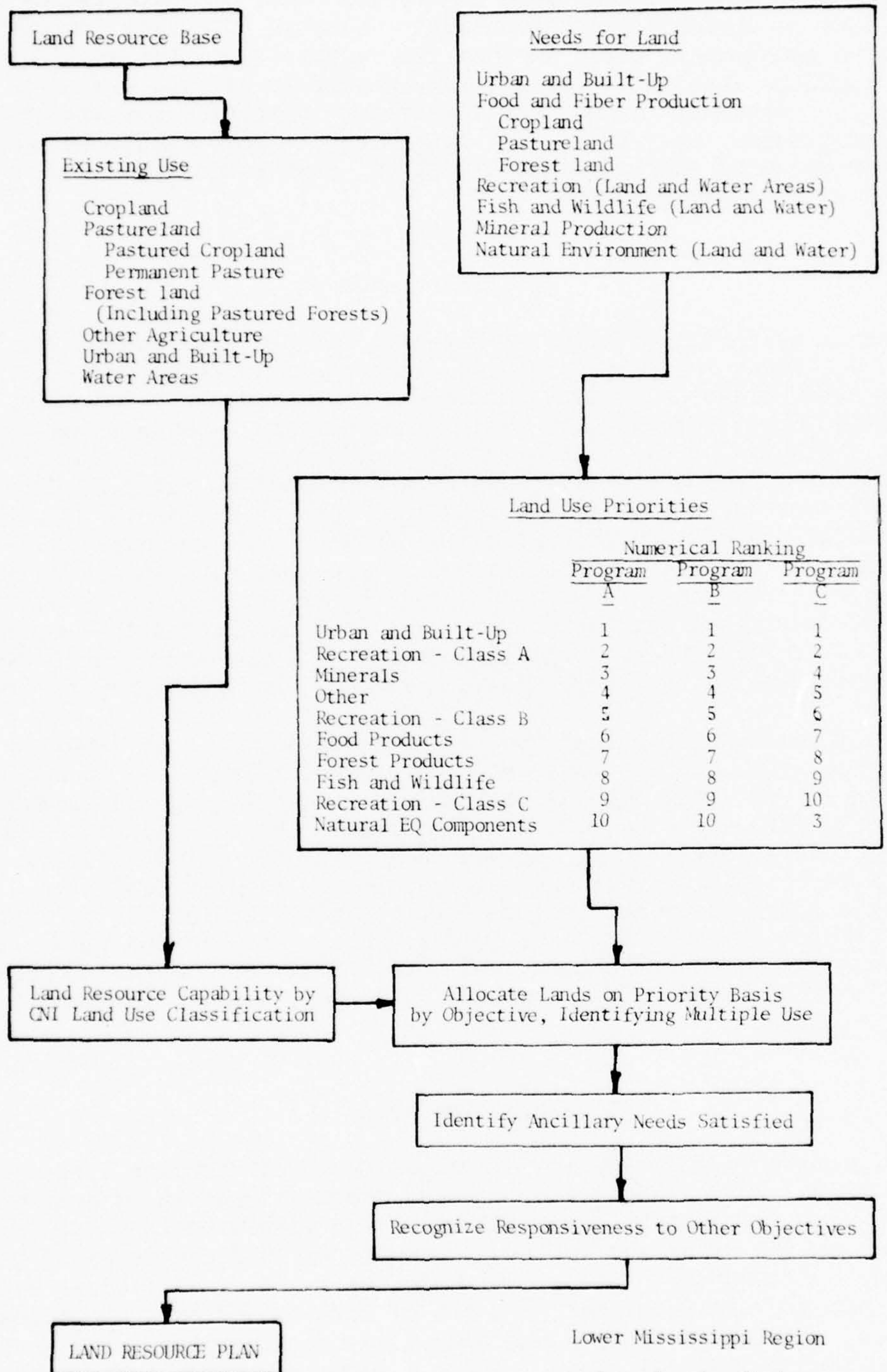
Wildlife Lands

Lands suitable for wildlife purposes include cropland and pasture edges, wetlands, and forests divided into specific cover types as: bottom-land hardwoods, upland hardwoods, pine-hardwoods, and pine. Identified needs for wildlife habitat and hunting lands were only partially satisfied by the allocation of available lands suitable for that purpose. The tremendous expressed need for wildlife lands could not be met by allocating the available resource, even when aided by multi-use of lands allocated to higher priority needs. After consultation with wildlife specialists, however, it was agreed that with intensive management of wildlife lands these needs could be scaled down by 30 percent to allow comparison with other competing uses on a compatible management base. Alternative means of public control of lands for wildlife were considered, including fee purchase, easements, and subsidies to landowners.

In formulating the land-use plan for satisfaction of fish and wildlife needs, it could not reasonably be assumed that shifts in needs for specific forest types such as bottom-land hardwoods, upland hardwoods, pine-hardwoods, and pine forests will occur. Nor could it reasonably be assumed that a satisfactory balance in the future mix of these habitat types will be attained without specific formulation by category. Nevertheless, it was necessary to formulate the plan without the benefit of a fully categorical allocation of forest land. Thus, in the formulated plan only the needs for bottom-land hardwood forest and the composite needs for other forests are compared with the available forests in these two categories.

Recreation Lands

Recreation land needs are expressed in three distinct types: (1) Class A lands - intensively managed and developed in or near urban areas. These recreation lands are multi-use with urban and built-up inasmuch as the urban and built-up category of land use is based on a mix which includes open and green space, parks, etc. (2) Class B lands - less managed and developed in a mix of forests and open space (may be multi-use with mixed forests and open lands such as pasture or unused cleared lands), and (3) Class C lands - forested, rough areas with minimal development and management.



Land Use Priorities

	Numerical Ranking		
	Program A	Program B	Program C
Urban and Built-Up	1	1	1
Recreation - Class A	2	2	2
Minerals	3	3	4
Other	4	4	5
Recreation - Class B	5	5	6
Food Products	6	6	7
Forest Products	7	7	8
Fish and Wildlife	8	8	9
Recreation - Class C	9	9	10
Natural EQ Components	10	10	3

Lower Mississippi Region

Comprehensive Study

LAND RESOURCE PLAN
PF SCHEMATIC

FIGURE 16

Since these areas comprise only very small acreages and all may be multi-use with the other broad-use categories, there was no difficulty insofar as availability of land resources for recreation was concerned.

Environmental Quality Components

Lands needed for environmental quality purposes consist of areas of particular geological, botanical, biological, or ecological significance; beaches and shores; bottom-land hardwood areas; wilderness areas; wetlands; and shorelines of streams, lakes, bays, and estuaries. Many such areas serve multi-uses and concurrently satisfy needs not only for environmental quality, but also for recreation, fish and wildlife habitat, selective timber harvest, and/or other primary uses. However, some of these areas are by their very nature exclusive of any other use. Each of the region's identified environmental quality components was described in terms of acres of land or water and those areas located and analyzed to determine appropriate alternative means and respective costs of control.

Archeological and Historical Resources

Program components for archeological and historical resources were formulated in a manner similar to that employed for other esthetic items, except that lands were not acquired. Archeological sites were counted in the various States, and narratives were written by archeologists to justify the need to explore, excavate, or otherwise investigate or control certain sites or groups of sites by future time frame. Historical resources were similarly identified and placed in the context of needs by future years. Needs data and justification are presented in Appendix P, Archeological and Historical Resources.

Program components were then budgeted for only those costs which fall in the public sector, using rough approximations of cost for intensive surveys, site testing, and site excavation, based on previous costs for similar work. Lands required in connection with management of archeological and historical resources were an insignificant part of the total land base and were generally absorbed in "other" lands, or considered multi-use with primary uses. Unit costs described above were considered to include allowance for satisfactory site control.

OTHER NEED AND PROBLEM CATEGORIES NOT DIRECTLY RELATED TO RESOURCE ALLOCATION

General

Other problems and needs not directly related to primary resource allocation are Water Quality, Navigation, Flood Damages, Excessive Wetness, Sediment and Erosion, Hydropower, Coastal and Estuarine, and Health Aspects. Each of these items was formulated in a different manner. Land treatment was considered a management practice for satisfying needs in several of the above categories.

Flood Control

Principal Streams

Flood problems on principal streams were identified on a stream basis and expressed as acres subject to flooding and accompanying monetary losses. Alternative means of damage prevention were considered for each problem area. The more practical alternatives were quantified as miles of levees, number and size of pumping plants, miles of channel enlargement, reservoir storage, etc., and costs were estimated using generalized cost curves. Those problems great enough to make the least costly alternative solution appear practical in terms of a reasonable chance of economic feasibility and overall implementability were selected for remedial treatment at the appropriate time frame. Flood-plain management is included for all urban areas regardless of whether or not structural programs are developed.

Upstream Watersheds

Flood problems in upstream areas were identified in watersheds of 250,000 acres or less on a watershed-by-watershed basis and expressed as acres subject to flooding and projected flood damages. Alternatives for damage prevention included installation of economically feasible watershed projects. Such projects involve land treatment and structural programs of reservoir storage, channel developments, levees, and pumping plants. Costs were estimated by using generalized cost curves and assuming the least costly alternative solution in terms of probable economic feasibility and possible implementation. Flood-plain management was included for all urban areas in upstream watersheds regardless of economic feasibility of the upstream projects.

Sediment and Erosion

Sediment and erosion problems were identified by hydrologic subareas within WRPA's. These problems were expressed in terms of acres of land area affected by erosion, miles of streambank erosion, and annual tons of sediment as a measure of extent of erosion, and were related

to average annual damages for 1980, 2000, and 2020. The more practical alternative means of damage prevention were proper use and treatment of the land, land-use adjustments, and streambank protection by both mechanical and vegetative means. The costs of streambank protection were based on the severity of the problem and an average cost per mile for installation of appropriate measures. The remaining sediment and erosion costs were included in costs of other needed land-treatment measures.

Excessive Wetness

Drainage problems were identified by acres of land use, land resource areas, and hydrologic subareas within WRPA's. Projected needs were based on land use expected to prevail in 1980, 2000, and 2020. It was assumed that no forest lands would require drainage in the future. Alternative means of meeting drainage needs were considered. The more practical of these alternatives were installation of on-farm drains and intrafarm drainage improvements for crop and pasture lands with this problem. Land treatment was another practical measure used. Drainage costs were estimated on a per-acre basis for recommended improvements using generalized cost curves.

Land Treatment

Land treatment is regarded as a management practice which relates to primary uses of land or as a complementary measure to satisfaction of flood control, drainage, or sediment and erosion problems. Therefore, a need for future land treatment is not recognized in a functional appendix. The framework programs contain land-treatment components and costs quantified after land-use allocations were completed, and an assessment made of such measures to optimize returns from allocated primary uses of lands. A discussion of status of land treatment as of 1970 can be found in Appendix F, Land Resources.

Water Quality

The projected organic waste loads, expressed as pounds of 5-day biochemical oxygen demand (BOD_5), were identified for each sewered community of 1,000 or more population. Municipal and industrial loadings were calculated and analyzed separately throughout the formulation process. When an industry having a large projected waste load was identified outside communities of 1,000 or more, it was also included in the analysis. The net loads to the receiving streams were then determined by subtracting the estimated existing treatment capacity in each WRPA. Waste load receiving streams were identified and the 1-in-10-year 7-day low streamflow estimated. This flow was used to estimate the organic waste load assimilative capacity of the stream, which was employed in formulation of the plans as one alternative means of satisfying the waste problem.

Water quality plan formulation was done in a manner to allow selection of any level of organic waste treatment at any of the planning time frames and to allow ready identification of the costs of that selection. In order to do this, three basic plans were identified under each objective. Each basic plan was formulated so as to meet State stream standards for minimum dissolved oxygen (D.O.) content. The first plan was the least-cost plan, consisting of use of the natural low streamflow assimilative capacity, up to the State standards (D.O.) followed by secondary treatment (municipal - 90 percent BOD_5 removal, industrial - 96 percent BOD_5 removal) as required, and then employing mechanical reaeration. No treatment was applied unless streams could not assimilate the waste load. The second plan employed uniform secondary treatment, followed by assimilative streamflow capacity and then mechanical reaeration. The third and final plan consisted of uniform advanced waste treatment (98 percent BOD_5 removal for both municipalities and industry) followed by streamflow assimilative capacity and then mechanical reaeration as required. These primary, or staging, plans provided the data for any mix of a range of treatment levels and attendant costs. Data were then readily available for identification of measures and costs to (1) meet State stream standards on a least-cost basis; (2) meet requirements of the 1972 Water Quality Act, which calls for uniform secondary treatment by the 1980 time frame, and uniform advanced treatment (to the highest "reasonable" treatment level technically feasible) by the 2000 and 2020 time frames; or (3) provide uniform advanced treatment by 1980. Unit average annual equivalent costs and unit investment costs of treatment were based on recently constructed treatment plants. Areas having potential for large regional treatment systems were identified and an appropriate lower unit annual cost was utilized. Costs were developed for municipal and industrial plants.

Bacterial problems for each area were quantified for future time frames.

Nonbiodegradable and exotic pollutants could not be adequately quantified due to insufficient data. Dissolved solids are not expected to cause significant regional problems in the next 50 years, even though there is a possibility of some dissolved solids problems due to upstream consumptive uses. This aspect of the pollution problem is discussed in detail on pages 406 to 410. General order of magnitude costs are identified herein for satisfying water quality needs associated with pollutants other than BOD_5 and bacteria based on a judgmental update of "Cost of Clean Water."

Navigation

Navigation needs expressed as ton-miles for waterways and tons for harbors were developed on a WRPA basis. The need was defined as that volume of commerce which is best suited to a waterborne mode of transport. Each WRPA was examined, and the most reasonable waterways identified and most efficient harbor sites located, based on previous and current detailed surveys and the judgment of experienced navigation

planning specialists. The alternative measures were listed as increased efficiency of existing waterways, additional and/or replacement locks on canalized waterways, new canalized waterways, and expansion of existing harbors and creation of new harbors. The costs of each applicable alternative were estimated and the least costly was selected.

Hydropower

The region imported nearly 30 percent of all power it consumed in 1970, while hydroelectric generators accounted for less than 1.0 percent of all electric energy generated within the region. The nature of hydroelectric power makes it an extremely desirable component of any well-designed power-generation system. Inasmuch as the region possesses a very limited number of economically feasible sites amenable to hydropower development, it was assumed that all sites which can be developed are needed whenever they can be brought on the line.

Existing and potential reservoirs and pumped storage sites suitable for new or increased hydropower production were identified on the basis of judgment, taking into account the head, available flow, volume of storage, and any restrictive operation rules.

The energy potential and value of marketable power at each site was estimated utilizing rule of thumb assumptions for plant factors, installed and dependable capacity, average annual energy, and pumped storage limitations. Rough cost estimates for development of each site were also made.

The potential sites were then screened to identify those which merited inclusion in the programs. Sites were selected that had an estimated benefit to cost ratio of 0.8 or more, a minimum installed capacity of 25 megawatts for conventional hydropower plants, or 300 megawatts for pumped storage projects.

Coastal and Estuarine

The water and related land-resource problems and needs in the coastal and estuarine zone of WRPA's 8, 9, and 10 span the entire spectrum of problem and need categories investigated in the inland planning areas. In addition, they include certain problems and needs unique to coastal areas. As a practical matter to avoid duplication in reporting on and formulation for the coastal area's problems and needs, those that relate directly to water supply, water quality, recreation, fish and wildlife, flood control, natural environment, and other functional resource needs were considered under those functional headings. In the Coastal and Estuarine Appendix, attention was focused on specific needs for salinity control and/or water level management and control of land losses. The latter category involves land loss due

to shoreline erosion, channelization and related erosion, and land subsidence. Plans for solving these problems and needs were formulated separately.

The procedure used in formulating plans for satisfying these needs deviated very little from the method explicated in the "General" paragraph, page 195. A specific plan formulated from identified alternatives included solutions such as locks, control structures, and related channels and levees for the diversion of water for salinity control. It also included similar solutions for land building and water level management, and measures for erosion control at selected sites. The single-objective, a first-cut plan, was modified for multiple-purpose, multiple-use of resources, and melded with other plans to satisfy competing demands on the resource. Where conflicts in resource use arose, compatible alternatives, although more costly, were sought and where applicable substituted in the plan. When alternatives did not exist, an evaluation was made of competing demands and the resource committed to that demand which had the least impact on the well-being of the people of the area. The plan, as modified by these considerations, was incorporated into the framework programs for the region.

Health Aspects

Problems related to health were expressed in Appendix M, Health Aspects, in terms of needs for State Drinking water programs and vector abatement districts by time frame. These future needs were cost-evaluated on the basis of historic expenditures as a base and included in the recommended framework program as State or public sector costs.

THE FRAMEWORK PROGRAM

GENERAL

The Framework Program is intended to serve as a guide for future action programs and continued planning. It is a blend of three single-objective programs. To understand the how and why of the program an understanding of its evolution is essential.

The base for all plan formulation was founded upon the economic and demographic parameters developed in Appendix B, Economics, for two of the Study's objectives: National Income (Program A) and Regional Development (Program B); and upon the quantification of natural environmental quality needs summarized in Appendix U. The cornerstone for the recommended program was molded from a WRPA-by-WRPA translation of the Program A and Program B parameters into single-objective water and land resource needs (see functional appendixes) unconstrained by budgetary, legal, or institutional considerations. Resource problems, such as flood control and water quality were recognized as existing concurrently. Separate sets of plans for the satisfaction of these problems and needs were then expressed as single-use plans, multiple-use plans, and multiple-purpose plans. Each step in the process took into consideration ways in which to pyramid the region's finite resources to satisfy the land and water needs for each planning area, consistent with its own special features.

In the absence of a unique set of economic and demographic parameters for the Environmental Quality Objective, the Appendix U needs oriented strictly to the natural environment were used as the planning nucleus for developing a third set of single-use, multiple-use, multiple-purpose plans on a WRPA basis. Plans thus defined for each objective were then grouped in three program sets, each emphasizing one of the three objectives without neglecting the others. To accomplish this, components from the National Income Objective set were added to those from the Environmental Quality Objective set insofar as the addition did not materially detract from the primary objective. Similarly, components from the Environmental Quality Objective set were added to the other sets. Constraints were then taken into account to complete the three programs in compliance with the requirement imposed by the Principles and Standards that all formulated programs be complete, realistic, implementable, and capable of adoption, though oriented to a specific national objective.

The completed product of the formulation exercise, the Coordinating Committee's recommended program, is a blend of the three single-objective programs in a multi-purpose, multi-objective program best suited, in the judgment of the Coordinating Committee, to serve as a guide for the future management of the water resources of the Lower Mississippi Region.

The alternate programs - National Income (Program A), Regional Development (Program B), and Environmental Quality - each provide a complete and implementable alternative framework for future development, management, and preservation of the region's land and water resources. These alternate programs, presented separately, are composed of three basic parts: plans for resource use; plans for problem amelioration (problems and needs not directly dependent on a resource allocation); and plans for public investment. Program measures for satisfying health, archeological and historical, and coastal and estuarine needs are identical for the alternate programs and the recommended program, and in the interest of avoiding unnecessary repetition are discussed in detail only in the section covering the recommended program.

Plans for resource use, including a description of proposed measures and their effectiveness relative to needs satisfaction, are presented under the major categories of water withdrawals, water surface area, and land area. The water available for withdrawals is a function of water generated by precipitation in the region, and of fluctuations in flows into the region from outside sources. Existing interregional water compacts and their influence on water availability are assumed to remain static during the study period. The water-surface area can be increased, but only at the expense of the land resource base. Plans for recreation, fish and wildlife, and environmental quality involve more than one category of resource use and are individually summarized just prior to the presentation of plans for problem amelioration.

NATIONAL INCOME PROGRAM

The National Income Program (Program A) is directed to efficiently increasing the output of goods and services, and raising the standard of living. Specific measures have been incorporated to preserve selected environmental quality attributes of the region.

Resource Use

Water Withdrawals

Though the study area is rich in supplies of both ground and surface water and has the capability to satisfy a ten- to twenty-fold increase in current requirements, supplies of suitable quality are not always available when and where needed. Thus the water resource must be managed so supplies of adequate quantity and quality can be delivered to each point of need in the future. The water-withdrawal plan for the National Income Program is presented in table 88. The plan indicates how the existing supply should be used and suggests management options for the future. The plan is based on the allocation of water supplies to satisfaction of needs on a least-cost basis consistent with study priorities wherein highest priority uses are assigned the cheapest water. Priorities within the water withdrawal plan (left to right on table 86) generally parallel adopted land-use priorities - urban oriented; economic preference; environmentally oriented - each successive category assigned a more expensive water supply.

The plan requires that some water users shift to new sources of supply in future years as local supplies fall short of needs and as higher priority uses require more water. Water supply problems presently exist or will manifest themselves in the future at several locations in the study area. The plan includes measures to solve these distributional problems (table 89).

In WRPA 9 the interregional diversion of up to 450 m.g.d. of Sabine River water by pumping plants and pipelines will be required to satisfy industrial needs presently supplied by ground water. About half of this Sabine River water will be required by the year 2000. Aside from this diversion, private sector intra-regional transfers of Atchafalaya River water amounting to about 568 m.g.d. and 2,796 m.g.d. will be required to satisfy 2020 needs for industrial and thermoelectric water, respectively, in WRPA 9. Intra-region transfer of 538 m.g.d. of Atchafalaya River water would also be required to satisfy year 2020 needs for irrigation and mineral production water in WRPA 9. Water supply storage near the point of use will be required in WRPA 5 to meet municipal and industrial needs which will exceed present supplies as early as the year 1980. Diversion utilizing a pumping station and distribution channels in WRPA 2 is included in the 1980-2000 time frame to provide for

Table 88 - Water Withdrawal Plan, Program A, Lower Mississippi Region 1/

WRPA/Time Frame		MUNICIPAL			INDUSTRIAL							RURAL DOMESTIC
		Ground	Surface		Ground		Surface					Ground
		Fresh	Fresh Stream	Storage	Fresh	Brackish	Fresh Stream	Brackish Stream	Storage	Inter-Region Transfer 2/	Intra-Region Transfer 2/	Fresh
WRPA 2	1970	34.8	0	0	38.8	0	0	0	0	0	0	24.7
	1980	40.1	0	0	58.3	0	0	0	0	0	0	20.6
	2000	56.6	0	0	142.8	0	0	0	0	0	0	16.0
	2020	82.6	0	0	332.0	0	0	0	0	0	0	10.6
WRPA 3	1970	141.8	0	0	98.0	0	0	0	0	0	0	19.3
	1980	175.7	0	0	149.5	0	0	0	0	0	0	20.0
	2000	278.1	0	0	351.2	0	0	0	0	0	0	14.3
	2020	408.8	0	0	800.6	0	0	0	0	0	0	11.9
WRPA 4	1970	53.8	0	0	49.1	0	37.5	0	0	0	0	21.7
	1980	65.7	0	0	74.3	0	61.2	0	0	0	0	18.9
	2000	89.8	0	0	173.6	0	146.8	0	0	0	0	14.7
	2020	123.7	0	0	375.7	0	353.6	0	0	0	0	11.1
WRPA 5	1970	37.5	16.8	0	119.3	0	87.4	0	0	0	0	16.1
	1980	42.8	16.8	6.3	124.8	0	87.3	0	95.3	0	0	14.4
	2000	56.4	22.3	11.1	345.9	0	204.1	0	133.9	0	0	12.2
	2020	86.4	31.6	15.8	766.9	0	558.3	0	172.6	0	0	5.5
WRPA 6	1970	7.5	0.6	0	28.4	0	33.1	0	0	0	0	6.7
	1980	8.4	0.7	0	37.4	0	33.9	0	0	0	0	5.2
	2000	10.6	0.8	0	72.6	0	63.3	0	0	0	0	3.9
	2020	13.6	1.1	0	131.4	0	129.9	0	0	0	0	2.7
WRPA 7	1970	12.0	0	0	73.1	0	0.5	0	0	0	0	5.2
	1980	15.3	0	0	104.6	0	0.9	0	0	0	0	4.6
	2000	22.1	0	0	170.9	0	64.1	0	0	0	0	3.4
	2020	32.8	0	0	179.9	0	329.2	0	0	0	0	1.9
WRPA 8	1970	54.3	1.0	0	159.0	3.0	1,352.2	0	0	0	0	4.5
	1980	71.0	1.0	0	549.0	5.0	1,707.3	0	0	0	0	4.9
	2000	107.6	1.0	0	682.0	13.0	4,973.5	0	0	0	0	6.1
	2020	156.8	1.0	0	778.0	32.0	13,030.9	0	0	0	0	8.4
WRPA 9	1970	65.0	6.9	0	238.0	0	39.0	1,024.3	0	0	0	16.8
	1980	85.1	6.9	0	311.0	589.0	123.1	1,024.3	0	0	0	15.1
	2000	119.3	6.9	0	542.0	2,732.0	154.6	1,024.3	0	292.0	0	14.7
	2020	160.9	6.9	0	1,050.0	7,528.0	160.5	1,024.3	0	450.0	568.0 3/	14.7
WRPA 10	1970	5.7	179.0	0	26.0	0	1,981.7	31.0	0	0	0	3.5
	1980	7.7	212.6	0	298.0	16.0	2,727.1	31.0	0	0	0	5.4
	2000	13.7	296.4	0	301.0	87.0	7,288.8	31.0	0	0	0	6.2
	2020	21.7	406.5	0	301.0	254.0	17,840.5	31.0	0	0	0	5.1
REGION	1970	412.4	204.3	0.0	829.7	3.0	3,531.4	1,055.3	0	0	0	118.5
	1980	511.8	238.0	6.3	1,706.9	610.0	4,740.8	1,055.3	95.3	0	0	109.1
	2000	754.2	327.4	11.1	2,782.0	2,832.0	12,895.2	1,055.3	133.9	292.0	0	91.5
	2020	1,087.3	447.1	15.8	4,715.5	7,814.0	32,402.9	1,055.3	172.6	450.0	568.0	71.9

Table 88 - Water Withdrawal Plan, Program A, Lower Mississippi Region 1/ (Cont'd)

WRPA/Time Frame		THERMOELECTRIC Ground Fresh	THERMOELECTRIC Ground Brackish	THERMOELECTRIC Surface Fresh Stream	THERMOELECTRIC Surface Brackish Stream	THERMOELECTRIC Surface Intra-Region Transfer	IRRIGATION Ground Fresh	IRRIGATION Surface Fresh Stream	IRRIGATION Surface Storage	IRRIGATION Surface Intra-Region Transfer	OTHER AGRICULTURAL Ground Fresh	OTHER AGRICULTURAL Surface Fresh Stream	COMMERCIAL FISHERIES Ground Fresh	COMMERCIAL FISHERIES Surface Fresh Stream
2	1970	5.0	0	394.0	0	0	2,114.0	271.3	101.8	0	2.0	7.5	40.0	59.9
	1980	5.0	0	394.0	0	0	1,918.2	400.8	233.0	0	5.1	1.6	52.0	78.0
	2000	5.0	0	636.5	0	0	1,918.2	213.1	259.8	350.0 4/	6.8	1.9	75.0	113.0
	2020	5.0	0	761.4	0	0	1,918.2	359.5	259.8	350.0 4/	5.0	5.9	50.0	197.0
3	1970	0	0	433.0	0	0	4.3	24.4	0	0	2.0	6.3	3.7	0
	1980	0	0	549.9	0	0	72.6	0	0	0	10.0	0	6.6	0
	2000	0	0	1,565.6	0	0	86.9	0	0	0	9.9	3.4	12.4	0
	2020	0	0	1,981.6	0	0	28.7	75.4	0	0	12.1	5.6	18.1	0
4	1970	25.0	0	280.0	0	0	171.7	124.3	0	0	3.4	5.2	56.5	14.1
	1980	25.0	0	970.2	0	0	217.9	158.7	0	0	4.1	6.6	98.9	24.7
	2000	25.0	0	970.2	0	0	230.2	168.1	0	0	5.2	8.8	183.9	45.9
	2020	25.0	0	1,082.3	0	0	244.0	177.2	0	0	7.0	11.6	268.9	67.1
5	1970	0.3	0	1,070.7	0	0	245.0	120.6	0	0	3.7	3.7	15.7	6.7
	1980	0.3	0	1,070.7	0	0	294.4	140.4	0	0	3.5	5.6	28.5	12.3
	2000	14.4	0	2,890.8	0	0	342.2	158.0	0	0	4.8	7.4	54.5	23.3
	2020	19.0	0	3,422.6	0	0	379.9	176.7	0	0	6.3	10.0	83.1	35.5
6	1970	0	0	0.3	0	0	116.0	36.6	0	0	2.6	1.1	6.1	2.6
	1980	0	0	82.3	0	0	142.7	46.6	0	0	1.8	2.8	17.2	7.4
	2000	0	0	547.8	0	0	154.1	49.4	0	0	2.3	3.8	39.4	16.9
	2020	0	0	649.8	0	0	170.1	54.7	0	0	3.1	5.1	61.7	26.4
7	1970	1.0	0	0	0	0	2.2	3.2	0	0	1.4	2.2	4.5	1.1
	1980	0	0	55.9	0	0	13.0	2.8	0	0	1.8	2.7	7.5	1.9
	2000	0	0	397.6	0	0	13.0	3.3	0	0	2.4	3.6	13.5	3.4
	2020	0	0	473.2	0	0	13.5	3.3	0	0	3.2	4.8	19.5	4.9
8	1970	1.0	8.0	579.4	0	0	1.2	0.3	0	0	2.2	2.8	1.0	0.9
	1980	1.0	16.0	1,240.7	0	0	1.5	12.0	0	0	5.0	0.8	1.0	3.4
	2000	1.0	60.0	4,686.1	0	0	1.5	12.4	0	0	5.0	2.7	1.0	8.4
	2020	1.0	72.0	5,561.0	0	0	1.5	12.9	0	0	5.0	5.1	1.0	13.4
9	1970	9.0	0	327.5	0	0	713.6	773.0	0	0	2.4	4.4	33.8	33.0
	1980	9.0	0	375.5	0	266.6 3/	1,007.0	177.8	0	0	8.2	0	52.8	33.0
	2000	9.0	0	375.5	0	2,135.6 3/	888.0	177.8	0	202.0	11.0	0	90.8	33.0
	2020	9.0	0	375.5	0	2,795.6 3/	726.0	177.7	0	466.0	14.6	0	128.7	33.0
10	1970	21.0	0	1,241.4	144.0	0	2.0	2.4	0	0	0.3	0.6	3.0	4.5
	1980	21.0	67.0	1,826.8	144.0	0	1.4	6.3	0	0	0	1.1	3.0	7.4
	2000	21.0	387.0	4,632.8	144.0	0	1.4	6.8	0	0	0	1.5	3.0	13.1
	2020	21.0	494.0	5,570.2	144.0	0	1.4	7.2	0	0	0	1.9	3.0	18.9
Region	1970	62.3	8.0	4,323.3	144.0	0	3,370.0	1,356.1	101.8	0	20.0	29.6	164.3	122.8
	1980	61.3	83.0	6,566.0	144.0	266.6	3,668.7	945.4	233.0	0	39.5	21.2	267.5	168.1
	2000	75.4	447.0	16,702.9	144.0	2,135.6	3,635.5	788.9	259.8	552.0	47.4	33.1	473.5	257.0
	2020	80.0	566.0	19,877.6	144.0	2,795.6	3,483.3	1,044.6	259.8	816.0	56.3	50.0	634.0	396.2

Table 88 - Water Withdrawal Plan, Program A, Lower Mississippi Region 1/ (Cont'd)

WRPA	Time Frame	MINERALS: Ground Fresh	MINERALS: Ground Brackish	MINERALS: Surface Fresh Stream	MINERALS: Surface Brackish Stream	MINERALS: Surface Intra-Region Transfer	FISH & WILDLIFE: Ground Fresh	FISH & WILDLIFE: Surface Fresh Stream	TOTALS: Ground Fresh	TOTALS: Ground Brackish	TOTALS: Surface Fresh Stream	TOTALS: Surface Brackish Stream	TOTALS: Surface Storage	TOTALS: Surface Inter-Region Transfer	TOTALS: Surface Intra-Region Transfer
2	1970	4.0	0	0	0	0	435.0	145.0	2,698.3	0	873.5	0	101.8	0	0
	1980	5.0	0	0	0	0	442.8	187.2	2,547.1	0	1,061.6	0	233.0	0	0
	2000	5.2	0	0	0	0	419.4	320.6	2,793.9	0	1,285.1	0	259.8	0	350.0
	2020	5.3	0	0	0	0	196.5	653.5	2,890.6	0	1,977.3	0	259.8	0	350.0
3	1970	0.7	0	0	0	0	25.0	8.0	294.8	0	468.7	0	0	0	0
	1980	0.9	0	0	0	0	68.0	8.0	503.3	0	557.9	0	0	0	0
	2000	1.4	0	0	0	0	149.0	13.0	903.2	0	1,582.0	0	0	0	0
	2020	0.7	0	1.4	0	0	187.4	60.6	1,468.3	0	2,124.6	0	0	0	0
4	1970	0.3	0	0.8	0	0	15.5	15.5	397.0	0	477.4	0	0	0	0
	1980	0.3	0	0.8	0	0	26.5	26.5	531.6	0	1,248.7	0	0	0	0
	2000	0.3	0	1.0	0	0	41.5	41.5	764.2	0	1,382.3	0	0	0	0
	2020	0.3	0	1.3	0	0	58.5	58.5	1,114.2	0	1,751.6	0	0	0	0
5	1970	45.5	0	9.5	0	0	12.7	241.3	495.8	0	1,556.7	0	0	0	0
	1980	63.2	0	11.7	0	0	14.2	270.8	586.1	0	1,615.6	0	101.6	0	0
	2000	69.1	0	12.9	0	0	17.2	327.8	916.7	0	3,646.6	0	145.0	0	0
	2020	76.0	0	14.1	0	0	20.2	386.8	1,443.3	0	4,635.6	0	188.4	0	0
6	1970	6.3	0	0.8	0	0	3.4	63.6	177.0	0	138.7	0	0	0	0
	1980	6.7	0	0.9	0	0	3.6	71.2	223.2	0	245.8	0	0	0	0
	2000	10.4	0	1.3	0	0	4.6	86.4	297.9	0	769.7	0	0	0	0
	2020	14.2	0	1.8	0	0	5.5	102.5	402.3	0	971.3	0	0	0	0
7	1970	3.2	0	0.5	0	0	2.5	2.5	105.1	0	10.0	0	0	0	0
	1980	4.1	0	0.6	0	0	3.5	3.5	154.4	0	68.3	0	0	0	0
	2000	5.8	0	0.9	0	0	6.5	6.5	237.6	0	479.4	0	0	0	0
	2020	7.6	0	1.2	0	0	9.0	9.0	267.4	0	825.6	0	0	0	0
8	1970	0	12.0	15.8	0	0	1.0	2.0	224.2	23.0	1,954.4	0	0	0	0
	1980	0	16.0	23.9	0	0	1.0	4.0	634.4	37.0	2,993.1	0	0	0	0
	2000	0	24.0	50.2	0	0	1.0	7.0	805.2	97.0	9,741.3	0	0	0	0
	2020	0	34.0	78.7	0	0	1.0	11.0	952.7	138.0	18,714.0	0	0	0	0
9	1970	0	0	18.0	254.0	0	121.0	363.0	1,199.6	0	1,564.8	1,278.3	0	0	0
	1980	0	144.2	18.0	254.0	10.0	194.0	363.0	1,682.2	733.2	1,097.3	1,278.3	0	0	276.6
	2000	0	412.0	18.0	254.0	39.0	382.0	363.0	2,056.8	3,144.0	1,128.8	1,278.3	0	292.0	2,376.6
	2020	0	692.3	18.0	254.0	72.0	502.0	363.0	2,605.9	8,220.3	1,134.6	1,278.3	0	450.0	3,901.6
10	1970	0	0	48.0	182.9	0	2.0	1,843.0	62.5	0	5,300.6	357.9	0	0	0
	1980	0	47.3	72.0	182.9	0	2.0	1,843.0	338.5	130.3	6,696.3	357.9	0	0	0
	2000	0	142.0	116.0	182.9	0	2.0	1,845.0	348.3	616.0	14,200.4	357.9	0	0	0
	2020	0	257.6	158.0	182.9	0	2.0	1,846.0	355.2	1,005.6	25,849.2	357.9	0	0	0
Region	1970	60.0	12.0	93.4	436.9	0	618.1	2,683.9	5,654.3	23.0	12,344.8	1,636.2	101.8	0	0
	1980	80.2	207.5	127.9	436.9	10.0	755.8	2,777.2	7,200.8	900.5	15,584.6	1,636.2	344.6	0	276.6
	2000	92.2	578.0	200.3	436.9	39.0	1,023.2	3,010.8	9,123.8	3,857.0	34,215.6	1,636.2	404.8	292.0	2,726.6
	2020	104.1	983.9	274.5	436.9	72.0	982.1	3,490.9	11,529.9	9,363.9	57,983.8	1,636.2	448.2	450.0	4,251.6

1/ All withdrawals are in mgd.
2/ Measure includes any required surface storage.
3/ Intra-Region Transfer does not include use of Mississippi River water by adjacent WRPA's (included under the category "Fresh Stream").
4/ Diversion water adds to fresh stream supply.

Table 89 - Program A Measures for Meeting Water Withdrawal Needs, Lower Mississippi Region

WRPA	Program Measures 1980	2000	2020
1	None	None	None
2	None[1/]	Pumping station and distribution channels to supply 350 m.g.d. irrigation water.	None
3	None	None	None
4	None	None	None
5	Storage reservoir to supply 175.0 m.g.d. municipal and industrial water.[2/]	None	None
6	None	None	None
7	None	None	None
8	None	None	None
9	Pumping plants and pipelines to supply 267 m.g.d. thermo-electric water and 10 m.g.d. mineral production water.	Pumping plants and pipelines to supply 1869 m.g.d. thermo-electric water, 29 m.g.d. mineral production water, 202 m.g.d. irrigation water and 292 m.g.d. industrial water.	Pumping plants and pipelines to supply 660 m.g.d. thermo-electric water, 33 m.g.d. mineral production water, 264 m.g.d. irrigation water and 726 m.g.d. industrial water.
10	None	None	None

1/ Private storage of irrigation water expected to satisfy needs. No federally constructed projects proposed.

2/ Reservoir sized to satisfy 2020 municipal and industrial water need because of nature of topography in WRPA 5. Storage includes 83.2 m.g.d. for use within the region and 91.8 m.g.d. for use outside the region. Requirements for 105.2 m.g.d. within the region in the year 2020 to be satisfied through use of existing DeGray Reservoir.

irrigation withdrawals presently supplied by ground water. (Authorization for the improvement of the Grand Prairie region and Bayou Meto basin - WRPA 2 - for flood control and drainage and the provision of an agricultural water supply is contained in the Flood Control Act approved 17 May 1950 in accordance with a plan presented in House Document 255, Eighty-first Congress, 1st Session. Pertinent data on the authorized plan and on considered modification thereto are given in House Document 308, Eighty-eighth Congress, 2nd Session.)

Water withdrawn but not consumed must be returned to the system in such quality that it will be suitable for reuse at downstream points in the system. At the same time, it must not unduly damage terrestrial or aquatic ecosystems. This does not mean that return waters must be potable upon discharge; rather, they must be of such quality so as not to require an unreasonable amount of treatment by the next user.

The effectiveness of the water withdrawal plan in terms of needs met through implementation of program measures and other prudent use of the water resource, is summarized in table 90. As shown, all water withdrawal needs in the region can be met by the plan.

Table 90 - Effectiveness of Water Withdrawal Plan, Program A, Lower Mississippi Region

Water Resources Planning Area	Time Frame	Withdrawal Category	Percent of Needs Met
All	All	Municipal	100
All	All	Industrial	100
All	All	Rural Domestic	100
All	All	Thermoelectric	100
All	All	Irrigation	100
All	All	Other Agricultural	100
All	All	Commercial Fisheries	100
All	All	Minerals	100
All	All	Fish and Wildlife	100

Water Surface Area

The three basic needs for water surface areas - recreation, fish and wildlife, and the natural environment - can be mutually satisfied by multi-use of existing water areas and by multi-use of water surface provided by storage for flood control, water supply, hydropower, and navigation. Nearly 100 percent of expressed needs are for water bodies of 40 acres or more in size, or large water areas shown in the future land plan. Exceptions are the fish and wildlife needs for ponds which are less than 40 acres in size and for streams, some of which are counted as small water. However, suitable streams cannot be created and the region's ponds are more than adequate to meet all foreseeable needs. Therefore, the future water plan consists of an increasing large water surface area and a constant small water surface area. It is recognized that small ponds will probably continue to be constructed, primarily for stock watering purposes, but the increase cannot be reasonably estimated and will not be great enough to materially affect land use plans. Some small water surface may be provided by catfish and crayfish farming operations but that water surface is impermanent, single-use, is included in the land use plan as a land requirement, and therefore is not included here. Significant aspects of the analysis leading to the formulated water surface area plan for the region are displayed in table 91.

As discussed in the Methodology section, the first step in the process involved an analysis of gross needs and net needs for recreation, fish and wildlife, and environmental water surface areas in light of existing impoundments and their ability to satisfy needs on a multi-use, inter-WRPA basis. From the analysis, it was concluded that the regional supply of water surface areas is sufficient to meet all needs for fish and wildlife and all environmental needs, except for a need to create 10,000 acres of lakes in WRPA 2. It was further concluded that the existing supply of water surface areas and potential multi-purpose reservoir developments are collectively inadequate to meet future water needs for water oriented recreation. Large deficits in water surface for recreation are in the offing in all planning areas except WRPA's 9 and 10. The greatest deficiency is expected in planning area 3. WRPA's 2 and 4 will face significant deficiencies in both large and small lakes in future years, whereas planning areas 5, 6, 7, and 8 will face deficits in small lakes in various time frames and a minor need for additional large lakes will arise in WRPA 6 between the years 2000 and 2020.

Water surface areas are regionally adequate to meet expected fish and wildlife needs, provided a WRPA 3 deficit can be met by surpluses in adjoining WRPA's. Such surpluses are adequate to meet the deficit, but a study assumption that internal WRPA needs for fishing can be met by external resources may be invalidated if the region's future populace lacks the means to travel 50 to 100 miles to fish. Hence, some portion of the fishing needs may remain unsatisfied. Ponds are adequate in terms of both total surface area and distribution to meet all foreseeable needs. However, only about 10 percent of the ponds are open to

Table 91 - Summary Analysis of Net Needs for Man-Made Water Surface, NI Objective, Lower Mississippi Region

(1,000 Acres)

Planning Area/Time		Recreation: Large Lakes	Recreation: Small Lakes	Fish & Wildlife: Lakes	Fish & Wildlife: Ponds[1]	Water Surface By-Product of Storage Requirements — Large Lakes: Flood Control	Large Lakes: Navigation	Large Lakes: Power	Large Lakes: Water Supply	Small Lakes: Flood Control	Small Lakes: Environmental Quality[6]	Largest Net Need or Sum of By-Products: Large Lakes	Small Lakes	Total
WRPA 2	1980	0	0	0	0	0	0	0	0[5]	23	10	0	33	33
	2000	27	26	0	0	0	0	14	0[5]	23	10	27	33	60
	2020	64	72	0	0	0	0	14	0[5]	24	10	64	72	136
WRPA 3	1980	71	114	0[2]	0	2	0	0	0	44	0	71	114	185
	2000	161	233	0[2]	0	2	0	0	0	65	0	161	233	394
	2020	312	423	0[2]	0	2	0	0	0	82	0	312	423	735
WRPA 4	1980	0	14	0	0	0	(14)[3]	14	0	6	0	14	14	28
	2000	7	83	0	0	0	(14)[3]	14	0	8	0	14	83	97
	2020	47	123	0	0	0	(14)[3]	14	0	10	0	47	123	170
WRPA 5	1980	0	0	0	0	26	0	0	0[4]	32	0	26	32	58
	2000	0	0	0	0	50	0	(20)[4]	(14)[4]	34	0	50	34	84
	2020	0	106	0	0	50	0	(20)[4]	(14)[4]	46	0	50	106	156
WRPA 6	1980	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	0	2	0	0	0	0	0	0	0	0	0	2	2
	2020	4	12	0	0	0	0	0	0	0	0	4	12	16
WRPA 7	1980	0	0	0	0	0	0	0	0	55	0	0	55	55
	2000	0	4	0	0	0	0	88	0	70	0	88	70	158
	2020	0	25	0	0	0	0	88	0	70	0	88	70	158
WRPA 8	1980	0	0	0	0	0	0	0	0	15	0	0	15	15
	2000	0	0	0	0	0	0	0	0	37	0	0	37	37
	2020	0	78	0	0	0	0	0	0	42	0	0	78	78
WRPA 9	1980	0	0	0	0	0	0	0	2	0	0	2	0	2
	2000	0	0	0	0	0	0	0	38	0	0	38	0	38
	2020	0	0	0	0	0	0	0	88	0	0	88	0	88
WRPA 10	1980	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	1	2	0	1	2	3
	2020	0	0	0	0	0	0	0	8	2	0	8	2	10
LMR	1980	71	128	0	0	28	(14)	14	2	175	10	113	263	376
	2000	195	348	0	0	52	(14)	116(20)	39	239	10	375	494	873
	2020	427	837	0	0	52	(14)	116(20)	96	276	10	657	886	1,547

1/ Pond resource more than adequate in all WRPA's, however, public does not have access to 90% of the needed pond areas.
2/ In reality, WRPA 3 has 1980, 2000, & 2020 deficits of 3, 12, & 24 thousand acres, respectively. Assumption that this WRPA need can be transferred, satisfied by regional surplus, may not be entirely true.
3/ Included in power pool (multi-use with power production).
4/ Included in FC pool water surface.
5/ There will be private storage development in WRPA 2 for irrigation purposes but no identified water surface data available.
6/ No conflict between EQ & NI exists in this case, therefore included in NI Objective.

public use. The program relies upon private actions stimulated by public educational measures to increase the number of ponds available.

The natural environmental quality needs for water surfaces can all be met within the National Income Objective water-surface plan. These needs are, with one exception, selected lakes and streams which already exist and were for the most part formed by nature. The one exception is the need for creation of 10,000 acres of lakes on Crowley's Ridge in WRPA 2.

Included in the analysis of needs was a listing of potential impoundments (of suitable size with capability to satisfy needs for recreation, fish and wildlife, and environmental purposes) to be created as the result of program components for satisfaction of flood control, water supply, navigation, and hydropower requirements. These surface areas were listed as water surface byproducts of storage requirements in table 91. The last three columns in table 91 reflect the future need for additional water surface and include that water surface which would be created by added storage facilities as programmed for flood control, water supply, hydropower, etc.

Potential for surface water development by WRPA was the final step in developing a preliminary water surface area plan. This potential, which is based on an inventory of reasonable reservoir sites, is displayed in table 92.

Table 92 - Development Potential for Large Water Surface, Lower Mississippi Region

	1,000 Acres		
WRPA	Large Lakes	Small Lakes	Total
1	-	-	-
2	14	99	113
3	158	511	669
4	14	146	160
5	50	230	280
6	0	15	15
7	88	70	158
8	0	155	155
9	140	0	140
10	14	2	16
LMR	478	1,228	1,706

The water surface area plan for the National Income Objective is presented in table 93. This plan permits the full satisfaction of all identified water surface area needs for environmental quality purposes. It will also permit, with one exception, the satisfaction of all water surface area needs for fish and wildlife. In WRPA 3 net needs for fish and wildlife will have to be satisfied from neighboring WRPA surplus resources, provided that access points are developed and measures instituted to insure public use of certain areas. The proposed additions to the region's large water areas, although limited by development potential, amount to 1.3 million acres and can provide for the satisfaction of a significant portion of the recreation needs. Because of the region's limited development potential, there is no practical solution for meeting all the recreation needs expected to accrue in WRPA's 2, 3, and 8 by the year 2000, nor for meeting the additional 2000-2020 needs foreseen in those WRPA's and in WRPA's 4 and 6. The water surface plan includes no provision for creating small water areas, bearing in mind that present acreages are already adequate to fulfill all foreseeable needs, and that small ponds (primarily for stock watering and fishing) will probably continue to be constructed. A summary of Program A measures for satisfying water surface needs is given in table 94.

In some cases, the total WRPA potential for additional water surface over and above that created for some other purpose was not used because it was not considered appropriate to provide additional single-purpose development of water surface in WRPA's other than where theneed exists. Non-Federal public agencies are not likely to make the large investment required to provide facilities to meet another area or State need. Table 95 summarizes the effectiveness of the water surface area plan in terms of needs met.

Land Area

Table 96 summarizes present land use and shows the prospective land use for satisfying Program A needs through the year 2020. The plan is consistent with adopted study priorities for land use allocation. The National Income Program does not include an action plan for insuring the availability of private sector acreages to satisfy urban and built-up needs or food and fiber needs. It does, however, contain an action plan for insuring that lands are made available for recreation, fish and wildlife, and for environmental quality purposes insofar as multiple-use of the land resource can serve these purposes without detracting materially from the satisfaction of urban and built-up needs or from the satisfaction of higher priority needs for food and fiber production.

Urban and Built-up. Regional acreages allocated to urban and built-up expansion increase 50 percent between 1970 and 2020. The subregional increases vary from a maximum of over 100 percent in WRPA 3 to less than 3 percent in WRPA 6. These increases will require the conversion of some existing cropland, pastureland, and forest areas to urban and built-up use. This conversion will in turn necessitate the clearing of additional forest areas to meet cropland and pasture needs.

Table 93 - Water Surface Area Plan, NI Objective, Lower Mississippi Region

WRPA	Time Frame	Large Water (1,000 Acres): Large Lakes[1] Existing[5]	Large Lakes[1] Proposed Addition	Large Lakes[1] Subtotal	Small Lakes[2] Existing[5]	Small Lakes[2] Proposed Addition	Small Lakes[2] Subtotal	Total Large Water	Small Water (1,000 Acres)[3] Existing[5]	Small Water Proposed Addition	Small Water Subtotal	Ponds (1,000 Acres)[4] Existing[5]	Ponds Proposed Addition	Ponds Subtotal	Total Water
2	1980	22	0	22	69	33	102	124	98	0	98	52	0	52	274
	2000		14[6]	36		0	102	138		0	98		0	52	288
	2020		0	36		39	141	177		0	98		0	52	327
3	1980	4	71	75	36	114	150	225	32	0	32	104	0	104	361
	2000		87[6]	162		119	269	431		0	32		0	104	567
	2020		0	162		190	459	621		0	32		0	104	757
4	1980	49	14[6]	63	25	14	39	102	133	0	133	54	0	54	289
	2000		0	63		69	108	171		0	133		0	54	358
	2020		0	63		40	148	211		0	133		0	54	398
5	1980	175	26	201	0	32	32	233	76	0	76	68	0	68	377
	2000		24[6]	225		2	34	259		0	76		0	68	403
	2020		0	225		72	106	331		0	76		0	68	475
6	1980	10	0[6]	10	22	0	22	32	40	0	40	16	0	16	88
	2000		0	10		2	24	34		0	40		0	16	90
	2020		0	10		10	34	44		0	40		0	16	100
7	1980	23	0	23	15	55	70	93	56	0	56	14	0	14	163
	2000		88[6]	111		15[6]	85	196		0	56		0	14	266
	2020		0	111		0	85	196		0	56		0	14	266
8	1980	51	0[6]	51	22	15	37	88	45	0	45	46	0	46	179
	2000		0	51		22	59	110		0	45		0	46	201
	2020		0	51		41	100	151		0	45		0	46	242
9	1980	316	2	318	84	0[6]	84	402	138	0	138	62	0	62	602
	2000		36	354		0	84	438		0	138		0	62	638
	2020		50	404		0	84	488		0	138		0	62	688
10	1980	432	0	432	507	0	507	939	219	0	219	117	0	117	1,275
	2000		1	433		2[6]	509	942		0	219		0	117	1,278
	2020		7	440		0	509	949		0	219		0	117	1,285
LMR	1980	1,082	113	1,195	780	263	1,043	2,606[7]	837	0	837	533	0	533	3,976[7]
	2000		250	1,445		231	1,274	3,087[7]		0	837		0	533	4,457[7]
	2020		57	1,502		392	1,666	3,536[7]		0	837		0	533	4,906[7]

1/ Lakes covering more than 500 acres.
2/ Lakes between 40 and 499 acres.
3/ Water surface areas between 2 and 39 acres in size.
4/ Water surface areas less than 2 acres in size. Counted as land area and included in the "other" category of land use.
5/ Natural water bodies and man-made water bodies (reservoirs and ponds) in place or under construction as of 1 July 1973.
6/ Proposed addition limited by development potential of WRPA.
7/ Includes 368,000 acres in Mississippi River (WRPA 1).

Table 94 - Program A, Measures Used to Meet Water Surface Area Needs, Lower Mississippi Region

Water Resources Planning Area and Need Category	Time Frame and Incremental Program Measures 1970-1980	1980-2000	2000-2020
WRPA 1	None	None	None
WRPA 2 Recreation	None	Construct, operate and maintain 14,000 acres of large lakes; provide multi-use of flood control reservoir required in 1980 time frame; provide multi-use of small lakes required in 1980 time frame for environmental quality.	Operate and maintain 1980-2000 measures; construct, operate and maintain additional 39,000 acres of small lakes.
Fish and Wildlife	Protect and improve access to 1,203 miles of fishing streams; promote public access to 26,000 acres of ponds.	Maintain 1970-1980 measures and promote public access to additional 3,000 acres of ponds.	Maintain 1970-2000 measures and promote public access to additional 5,000 acres of ponds.
Environmental Quality	Construct, operate and maintain 10,000 acres of small lakes; control and restore 9,420 acres of land to preserve 157 miles of scenic rivers; regulate land-use on 12,600 acres to preserve 210 miles of scenic rivers; provide landowner subsidy to protect 2,175 acres of sparsely developed lake shores.	Operate and maintain 1970-1980 measures.	Operate and maintain 1970-1980 measures.
WRPA 3 Recreation	Construct 71,000 acres of large lakes and 114,000 acres of small lakes.	Operate and maintain 1970-1980 measures; construct operate and maintain additional 87,000 acres of large lakes and 119,000 acres of small lakes.	Operate and maintain 1970-2000 measures; construct, operate and maintain additional 190,000 acres of small lakes.
Fish and Wildlife	Protect and improve access to 822 miles of fishing streams; promote public access to 60,000 acres of ponds.	Maintain 1970-1980 measures and promote public access to additional 21,000 acres of ponds.	Maintain 1970-2000 measures and promote public access to additional 30,000 acres of ponds.
Environmental Quality	Purchase 2,100 acres to preserve 194 miles of scenic rivers; provide landowner subsidy on 27,740 acres to preserve 320 miles of scenic rivers; purchase 100 acres, purchase and reforest 400 acres and provide subsidy on 500 acres to preserve scenic lakes.	Maintain 1970-1980 measures	Maintain 1970-1980 measures
WRPA 4 Recreation	Construct 14,000 acres of small lakes.	Operate and maintain 1970-1980 measures; provide for multi-use of reservoir required in 1970-1980 time frame for power; construct, operate and maintain additional 69,000 acres of small lakes.	Operate and maintain 1970-2000 measures; construct, operate and maintain additional 40,000 acres of small lakes.
Fish and Wildlife	Protect and improve access to 1,100 miles of fishing streams; promote public access to 27,000 acres of ponds.	Maintain 1970-1980 measures and promote public access to additional 3,000 acres of ponds.	Maintain 1970-2000 measures and promote public access to additional 6,000 acres of ponds.

Table 54 - Program A, Measures Used to Meet Water Surface Area Needs, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	Time Frame and Incremental Program Measures 1970-1980	1980-2000	2000-2020
WRPA 4 (Cont'd)			
Environmental Quality	Provide subsidy on 4,470 acres to preserve sparely developed shorelines of scenic lakes.	Maintain 1970-1980 measures	Maintain 1970-1980 measures.
WRPA 5			
Recreation	Construct, operate and maintain 32,000 acres of small lakes.	Operate and maintain 1970-1980 measures; construct, operate and maintain additional 34,000 acres of small lakes.	Operate and maintain 1970-2000 measures; construct, operate and maintain additional 106,000 acres of small lakes.
Fish and Wildlife	Protect and improve access to 1,931 miles of fishing streams; promote public access to 36,000 acres of ponds.	Maintain 1970-1980 measures and promote public access to additional 7,000 acres of ponds.	Maintain 1970-2000 measures and promote public access to additional 9,000 acres of ponds.
Environmental Quality	Acquire easement on 14,242 acres to protect 294 miles of scenic rivers; purchase 730 acres and provide landowner subsidy on 846 acres to protect sparsely developed shorelines of scenic lakes.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 6			
Recreation	None	Construct, operate and maintain 2,000 acres of small lakes.	Operate and maintain 1980-2000 measures; construct, operate and maintain additional 10,000 acres of small lakes.
Fish and Wildlife	Protect and improve access to 536 miles of fishing streams; promote public access to 8,000 acres of ponds.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
Environmental Quality	Provide landowner subsidy on 1,305 acres to protect sparsely developed shoreline of scenic lakes.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 7			
Recreation	None	Provide for multi-use of reservoir(s) required for flood control in 1970-1980 time frame.	Provide for multi-use of reservoir(s) required for flood control in 1970-2000 time frame.
Fish and Wildlife	Protect and improve access to 450 miles of fishing streams; promote public access to 7,000 acres of ponds.	Maintain 1970-1980 measures and promote public access to additional 1,000 acres of ponds.	Maintain 1970-2000 measures and promote public access to additional 1,000 acres of ponds.
Environmental Quality	Acquire easement on 13,000 acres to preserve 266 miles of scenic rivers; provide subsidy on 965 acres to protect sparsely developed shorelines of scenic lakes.	Maintain1970-1980 measures.	Maintain 1970-1980 measures.

Table 94 - Program A, Measures Used to Meet Water Surface Area Needs, Lower Mississippi Region

Water Resources Planning Area and Need Category	Time Frame and Incremental Program Measures		
	1970-1980	1980-2000	2000-2020
WRPA 8			
Recreation	None	None	Construct, operate and maintain 36,000 acres of small lakes for single purpose recreation and 5,000 acres of multi-purpose lakes for recreation and flood control.
Fish and Wildlife	Protect and improve access to 400 miles of fishing streams; promote public access to 26,000 acres of ponds.	Maintain 1970-1980 measures; promote public access to additional 7,000 acres of ponds.	Maintain 1970-2000 measures; promote public access to additional 10,000 acres of ponds.
Environmental Quality	Acquire easement on 9,155 acres to preserve 189 miles of scenic rivers; provide landowner subsidy on 860 acres to protect sparsely developed shoreline of scenic lakes.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 9			
Recreation	None	None	None
Fish and Wildlife	Protect and improve access to 928 miles of fishing streams; promote public access to 32,000 acres of ponds.	Maintain 1970-1980 measures; promote public access to additional 5,000 acres of ponds.	Maintain 1970-2000 measures; promote public access to additional 6,000 acres of ponds.
Environmental Quality	Acquire easement on 3,070 acres to preserve scenic rivers; purchase 70 acres and provide landowner subsidy on 3,420 acres to protect sparsely developed shorelines of scenic lakes.	Maintain 1970-1980 measures.	Maintain 1970-2000 measures.
WRPA 10			
Recreation	None	None	None
Fish and Wildlife	Protect and improve access to 329 miles of fishing streams; promote public access to 62,000 acres of ponds.	Maintain 1970-1980 measures; promote public access to additional 18,000 acres of ponds.	Maintain 1970-2000 measures; promote public access to additional 23,000 acres of ponds.
Environmental Quality	Provide landowner subsidy on 4,405 acres to protect sparsely developed shorelines of scenic lakes.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.

Table 95 - Effectiveness of Water Surface Area Plan, Program A, Lower Mississippi Region

Water Resources Planning Area and Need Category	Time Frame and Percent of Gross Needs Met: 1970-1980 Lakes Large	Lakes Small	Lakes Total	Ponds	Streams	1980-2000 Lakes Large	Lakes Small	Lakes Total	Ponds	Streams	2000-2020 Lakes Large	Lakes Small	Lakes Total	Ponds	Streams
WRPA 2															
Recreation	100	100	-	-	-	92	100	-	-	-	80	100	-	-	-
Fish and Wildlife	-	-	100	100	100 1/	-	-	100	100	100 1/	-	-	100	100	87 2/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 3															
Recreation	100	100	-	-	-	99	100	-	-	-	81	100	-	-	-
Fish and Wildlife	-	-	100 3/	100	34 2/	-	-	100 3/	100	25 2/	-	-	100 3/	100	18 2/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 4															
Recreation	100	100	-	-	-	100	100	-	-	-	87	100	-	-	-
Fish and Wildlife	-	-	100	100	100 1/	-	-	100	100	91 2/	-	-	100	100	76 2/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 5															
Recreation	100	100	-	-	-	100	100	-	-	-	100	100	-	-	-
Fish and Wildlife	-	-	100	100	100 1/	-	-	100	100	100 1/	-	-	100	100	92 2/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 6															
Recreation	100	100	-	-	-	100	100	-	-	-	93	100	-	-	-
Fish and Wildlife	-	-	100	100	100 1/	-	-	100	100	100 1/	-	-	100	100	100 1/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 7															
Recreation	100	100	-	-	-	100	100	-	-	-	100	100	-	-	-
Fish and Wildlife	-	-	100	100	100 1/	-	-	100	100	100 1/	-	-	100	100	100 1/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 8															
Recreation	100	100	-	-	-	100	100	-	-	-	100	100	-	-	-
Fish and Wildlife	-	-	100	100	38 2/	-	-	100	100	30 2/	-	-	100	100	23 2/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 9															
Recreation	100	100	-	-	-	100	100	-	-	-	100	100	-	-	-
Fish and Wildlife	-	-	100	100	71 2/	-	-	100	100	63 2/	-	-	100	100	54 2/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100
WRPA 10															
Recreation	100	100	-	-	-	100	100	-	-	-	100	100	-	-	-
Fish and Wildlife	-	-	100	100	13 2/	-	-	100	100	10 2/	-	-	100	100	8 2/
Environmental Quality	-	-	100	-	100	-	-	100	-	100	-	-	100	-	100

1/ Stream resources surplus to inter-WRPA needs could satisfy indeterminate percentage of unmet needs.
2/ Additional indeterminate percentage of needs can be satisfied by fishing on the Mississippi River in WRPA 1.
3/ Assuming that lakes surplus to needs in bordering WRPA's can satisfy WRPA 3 needs.

Table 96 - Land Use Plan, Program A, Lower Mississippi Region

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 1				
Open Land				
Transportation, Urban and Built-up	-	-	-	-
Food and Fiber				
Cropland	188.0	188.0	188.0	188.0
Pastured Cropland	30.0	30.0	30.0	30.0
Permanent Pasture	32.0	32.0	32.0	32.0
Other	62.0	62.0	62.0	62.0
Commercial Fisheries	-	-	-	-
Minerals	-	-	-	-
Recreation				
Class A	-	-	-	-
Class B	-	-	-	-
Fish and Wildlife				
(Cropland)	-	-	-	-
(Pastureland)	-	-	-	-
(Wetlands)	-	-	-	-
Environmental Quality	-	-	-	-
Forest Land				
Food and Fiber				
Forest Products, et al.	879.0	879.0	879.0	879.0
Animal Roughage (Pasture)1/	(135.0)	(135.0)	(135.0)	(368.0)
Recreation				
Class B	-	-	-	-
Class C	-	-	-	-
Fish and Wildlife2/	(131.1)	(131.1)	(131.1)	(131.1)
Environmental Quality				
Botanical Systems	-			
Bottomland Hardwood Areas1/	(879.0)	(879.0)	(879.0)	(879.0)
Ecological Systems	-	-	-	-
Geological Systems	-	-	-	-
Lake Shores1/	-	(6.0)	(6.0)	(6.0)
Scenic River Banks	-	-	-	-
Wetlands	-	-	-	-
Wilderness Areas	-	-	-	-
Land Covered by Water				
Large Water Areas	368.0	368.0	368.0	368.0
Small Water Areas	-	-	-	-
Total Area, WRPA 1	1,559.0	1,559.0	1,559.0	1,559.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 2				
Open Land				
Transportation,				
Urban and Built-up	367.0	378.0	396.0	459.0
Food and Fiber				
Cropland	6,192.0	7,201.0	7,618.0	7,761.0
Pastured Cropland	380.0	501.0	504.0	514.0
Permanent Pasture	693.0	314.0	319.0	326.0
Other	247.0	379.0	253.0	174.0
Commercial Fisheries3/	(16.0)	(21.0)	(30.0)	(40.0)
Minerals3/	(26.0)	(35.0)	(56.0)	(87.0)
Recreation				
Class A4/	(6.1)	(7.1)	(8.4)	(12.1)
Class B5/	(7.1)	(7.5)	(7.5)	(10.4)
Fish and Wildlife				
(Cropland)6/	-	(288.0)	(319.0)	(375.0)
(Pastureland)5/	-	(123.0)	(137.0)	(161.0)
(Wetlands)3/	-	(101.0)	(101.0)	(101.0)
Environmental Quality				
Open and Green Space7/	(6.1)	(8.0)	(8.0)	(8.0)
Ecological Systems8/		1.0	1.0	1.0
Geological Systems5/		(157.0)	(157.0)	(157.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,634.0	1,706.0	1,375.0	1,192.0
Animal Roughage (Pasture)1/	(365.0)	(447.0)	(454.0)	(775.0)
Recreation				
Class B1/	(7.0)	(7.6)	(7.6)	(10.4)
Class C1/	(0.6)	(0.6)	(0.7)	(0.9)
Fish and Wildlife2/	(280.5)	(381.0)	(444.6)	(535.3)
Environmental Quality				
Bottomland Hardwood Areas1/	(1,128.0)	(690.0)	(530.0)	(444.0)
Ecological Systems1/		(120.0)	(120.0)	(120.0)
Geological Systems1/		(350.0)	(350.0)	(350.0)
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(18.0)	(18.0)	(18.0)
Wilderness Areas1/		(44.0)	(44.0)	(44.0)
Land Covered by Water				
Large Water Areas	91.0	124.0	138.0	177.0
Small Water Areas	98.0	98.0	98.0	98.0
Total Area, WRPA 2	10,702.0	10,702.0	10,702.0	10,702.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 3				
Open Land				
Transportation, Urban and Built-up	355.0	401.0	536.0	724.0
Food and Fiber				
Cropland	2,206.0	2,094.0	2,170.0	2,346.0
Pastured Cropland	746.0	1,117.0	1,219.0	1,314.0
Permanent Pasture	929.0	501.0	551.0	583.0
Other	200.0	392.0	379.0	354.0
Commercial Fisheries3/	(0.6)	(1.0)	(2.0)	(3.0)
Minerals3/	(2.0)	(4.0)	(9.0)	(14.0)
Recreation				
Class A4/	(2.9)	(13.8)	(23.5)	(39.0)
Class B5/	(2.4)	(11.9)	(20.2)	(33.6)
Fish and Wildlife				
(Cropland)6/	-	(652.0)	(890.0)	(1,214.0)
(Pastureland)5/	-	(279.0)	(380.0)	(520.0)
(Wetlands)3/	-	(41.0)	(41.0)	(41.0)
Environmental Quality7/	(2.9)	(34.0)	(34.0)	(34.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,310.0	2,056.0	1,500.0	844.0
Animal Roughage (Pasture)1/	(297.0)	(464.0)	(921.0)	(551.0)
Recreation				
Class B1/	(2.3)	(11.9)	(20.3)	(33.6)
Class C1/	(0.2)	(1.2)	(1.9)	(3.0)
Fish and Wildlife2/	(186.3)	(228.1)	(266.2)	(320.5)
Environmental Quality				
Bottomland Hardwood Areas1/	(796.0)	(700.0)	(503.0)	(444.0)
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(28.0)	(28.0)	(28.0)
Wetlands1/		(64.0)	(64.0)	(64.0)
Land Covered by Water				
Large Water Areas	40.0	225.0	431.0	621.0
Small Water Areas	32.0	32.0	32.0	32.0
Total Area, WRPA 3	6,818.0	6,818.0	6,818.0	6,818.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 4				
Open Land				
Transportation, Urban and Built-up	328.0	335.0	361.0	426.0
Food and Fiber				
Cropland	3,314.0	3,545.0	4,274.0	4,391.0
Pastured Cropland	326.0	578.0	526.0	495.0
Permanent Pasture	943.0	1,819.0	1,505.0	1,482.0
Other	207.0	253.0	230.0	163.0
Commercial Fisheries3/	(11.3)	(20.0)	(37.0)	(54.0)
Minerals3/	(3.0)	(3.0)	(4.0)	(5.0)
Recreation				
Class A4/	(0.8)	(3.8)	(5.4)	(8.0)
Class B5/	(1.0)	(3.1)	(4.4)	(6.5)
Fish and Wildlife				
(Cropland)6/	-	(292.0)	(327.0)	(391.0)
(Pastureland)5/	-	(125.0)	(140.0)	(167.0)
(Wetlands)3/	-	(97.0)	(97.0)	(97.0)
Environmental Quality7/	(0.8)	(8.0)	(8.0)	(8.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	3,222.0	1,782.0	1,347.0	1,246.0
Animal Roughage (Pasture)1/	(587.0)	(1,073.0)	(875.0)	(800.0)
Recreation				
Class B1/	(0.9)	(3.1)	(4.4)	(6.5)
Class C1/	(26.0)	(26.0)	(32.1)	(45.5)
Fish and Wildlife2/	(165.4)	(257.6)	(300.6)	(361.9)
Environmental Quality				
Bottomland Hardwood Areas1/	(1,148.0)	(947.0)	(947.0)	(947.0)
Ecological Systems1/		(10.0)	(10.0)	(10.0)
Geological Systems1/		(1.0)	(1.0)	(1.0)
Lake Shores1/		(2.0)	(2.0)	(2.0)
Wilderness Areas1/		(5.0)	(5.0)	(5.0)
Land Covered by Water				
Large Water Areas	74.0	102.0	171.0	211.0
Small Water Areas	133.0	133.0	133.0	133.0
Total Area, WRPA 4	8,547.0	8,547.0	8,547.0	8,547.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 5				
Open Land				
Transportation, Urban and Built-up	440.0	458.0	532.0	647.0
Food and Fiber				
Cropland	732.0	736.0	844.0	1,116.0
Pastured Cropland	239.0	621.0	653.0	690.0
Permanent Pasture	982.0	856.0	902.0	968.0
Other	192.0	262.0	247.0	217.0
Commercial Fisheries 3/	(3.6)	(6.0)	(12.0)	(18.0)
Minerals 3/	(8.0)	(9.0)	(9.0)	(10.0)
Recreation				
Class A 4/	(2.6)	(6.1)	(9.1)	(13.5)
Class B 5/	(2.3)	(5.2)	(7.7)	(11.5)
Fish and Wildlife				
(Cropland) 6/	-	(394.0)	(467.0)	(572.0)
(Pastureland) 5/	-	(169.0)	(200.0)	(245.0)
Environmental Quality 7/	(2.6)	(13.0)	(13.0)	(13.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	10,228.0	9,831.0	9,551.0	9,019.0
Animal Roughage (Pasture) 1/	(947.0)	(1,048.0)	(1,090.0)	(1,515.0)
Recreation				
Class B 1/	(2.2)	(5.3)	(7.5)	(11.6)
Class C 1/	(23.8)	(23.8)	(31.5)	(46.9)
Fish and Wildlife				
Management Areas, etc. 2/	(258.4)	(361.9)	(422.3)	(508.5)
Wetlands 1/	-	(531.0)	(723.0)	(791.0)
Environmental Quality				
Bottomland Hardwood Areas 1/	(2,362.0)	(2,284.0)	(2,262.0)	(2,171.0)
Ecological Systems 1/		(20.0)	(20.0)	(20.0)
Geological Systems 1/		(22.0)	(22.0)	(22.0)
Lake Shores 1/		(1.0)	(1.0)	(1.0)
Scenic River Banks 1/		(28.0)	(28.0)	(28.0)
Wilderness Areas 1/		(25.0)	(25.0)	(25.0)
Land Covered by Water				
Large Water Areas	175.0	233.0	259.0	331.0
Small Water Areas	76.0	76.0	76.0	76.0
Total Area, WRPA 5	13,064.0	13,064.0	13,064.0	13,064.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 6				
Open Land				
Transportation, Urban and Built-up	78.0	79.0	79.0	80.0
Food and Fiber				
Cropland	1,908.0	2,090.0	2,090.0	2,090.0
Pastured Cropland	118.0	137.0	137.0	137.0
Permanent Pasture	494.0	468.0	468.0	468.0
Other	32.0	35.0	35.0	35.0
Commercial Fisheries 3/	(1.4)	(4.0)	(9.0)	(14.0)
Minerals 3/	(2.0)	(2.0)	(3.0)	(4.0)
Recreation				
Class A 4/	(0.5)	(1.7)	(2.2)	(2.9)
Class B 5/	(0.4)	(1.5)	(1.9)	(2.5)
Fish and Wildlife				
(Cropland) 6/	-	(83.0)	(83.0)	(91.0)
(Pastureland) 5/	-	(35.0)	(36.0)	(39.0)
Environmental Quality				
Open and Green Space 7/	(0.5)	(2.0)	(2.0)	(2.0)
Botanical Systems 8/		1.0	1.0	1.0
Forest Land				
Food and Fiber				
Forest Products, et al.	831.0	652.0	650.0	639.0
Animal Roughage (Pasture) 1/	(117.0)	(224.0)	(234.0)	(415.0)
Recreation				
Class B 1/	(0.3)	(1.5)	(1.9)	(2.6)
Class C 1/	(0.0)	(0.2)	(0.2)	(0.2)
Fish and Wildlife				
Management Areas, etc. 2/	(45.2)	(70.2)	(81.9)	(98.6)
Wetlands 1/	-	(85.0)	(85.0)	(85.0)
Environmental Quality				
Bottomland Hardwood Areas 1/	(756.0)	(609.0)	(609.0)	(609.0)
Land Covered by Water				
Large Water Areas	32.0	32.0	34.0	44.0
Small Water Areas	40.0	40.0	40.0	40.0
Total Area, WRPA 6	3,533.0	3,533.0	3,533.0	3,533.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres)		
		1980	2000	2020
WRPA 7				
Open Land				
Transportation, Urban and Built-up	116.0	121.0	136.0	151.0
Food and Fiber				
Cropland	337.0	197.0	147.0	170.0
Pastured Cropland	180.0	315.0	520.0	657.0
Permanent Pasture	941.0	1,018.0	1,726.0	2,075.0
Other	30.0	68.0	49.0	12.0
Commercial Fisheries3/	(0.9)	(1.0)	(3.0)	(4.0)
Minerals3/	(1.0)	(1.0)	(1.0)	(1.0)
Recreation				
Class A4/	(0.4)	(1.6)	(2.2)	(3.3)
Class B5/	(0.4)	(1.3)	(1.9)	(2.8)
Fish and Wildlife				
(Cropland)6/	-	(74.0)	(85.0)	(103.0)
(Pastureland)5/	-	(32.0)	(36.0)	(44.0)
Environmental Quality7/	(0.4)	(1.0)	(1.0)	(1.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,509.0	2,339.0	1,377.0	890.0
Animal Roughage (Pasture)1/	(694.0)	(1,251.0)	(895.0)	(580.0)
Recreation				
Class B	(0.3)	(1.4)	(2.0)	(2.9)
Class C	(0.1)	(0.1)	(0.2)	(0.3)
Fish and Wildlife				
Management Areas, etc.2/	(74.0)	(104.0)	(121.4)	(146.1)
Wetlands1/	-	(49.0)	(49.0)	(49.0)
Environmental Quality				
Bottomland Hardwood Areas1/	(500.0)	(463.0)	(407.0)	(407.0)
Ecological Systems1/		(3.0)	(3.0)	(3.0)
Geological Systems1/		(1.0)	(1.0)	(1.0)
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(13.0)	(13.0)	(13.0)
Wilderness Areas1/		(30.0)	(30.0)	(30.0)
Land Covered by Water				
Large Water Areas	38.0	93.0	196.0	196.0
Small Water Areas	56.0	56.0	56.0	56.0
Total Area, WRPA 7	4,207.0	4,207.0	4,207.0	4,207.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres)		
		1980	2000	2020
WRPA 8				
Open Land				
Transportation, Urban and Build-up	182.0	206.0	260.0	333.0
Food and Fiber				
Cropland	329.0	217.0	170.0	193.0
Pastured Cropland	54.0	349.0	367.0	391.0
Permanent Pasture	655.0	587.0	616.0	650.0
Other	48.0	59.0	47.0	21.0
Commercial Fisheries3/	(0.3)	(1.0)	(1.0)	(2.0)
Minerals3/	(4.0)	(5.0)	(6.0)	(8.0)
Recreation				
Class A4/	(0.5)	(6.0)	(9.6)	(15.3)
Class B5/	(0.9)	(5.2)	(8.3)	(13.1)
Fish and Wildlife				
(Cropland)6/	-	(217.0)	(170.0)	(193.0)
(Pastureland)5/	-	(122.0)	(156.0)	(262.0)
Environmental Quality				
Open and Green Space7/	(0.5)	(12.0)	(12.0)	(12.0)
Botanical Systems8/	-	1.0	1.0	1.0
Geological Systems5/	-	(1.0)	(1.0)	(1.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,265.0	2,099.0	2,035.0	1,866.0
Animal roughage (Pasture)1/	(650.0)	(615.0)	(1,183.0)	(1,213.0)
Recreation				
Class B1/	(0.8)	(5.2)	(8.3)	(13.2)
Class C1/	(0.0)	(0.5)	(0.8)	(1.2)
Fish and Wildlife				
Management Areas,etc.2/	(5.0)	(19.0)	(22.2)	(26.7)
Wetlands1/	-	(144.0)	(190.0)	(395.0)
Environmental Quality				
Botanical Systems1/	-	(2.0)	(2.0)	(2.0)
Bottomland Hardwood Areas1/	(988.0)	(916.0)	(888.0)	(814.0)
Geological Systems1/	-	(202.0)	(202.0)	(202.0)
Lake Shores1/	-	(1.0)	(1.0)	(1.0)
Scenic River Banks1/	-	(17.0)	(17.0)	(17.0)
Land Covered by Water				
Large Water Areas	73.0	88.0	110.0	151.0
Small Water Areas	45.0	45.0	45.0	45.0
Total Area, WRPA 8	3,651.0	3,651.0	3,651.0	3,651.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 9				
Open Land				
Transportation, Urban and Built-up	236.0	243.0	271.0	314.0
Food and Fiber				
Cropland	1,827.0	2,673.0	2,623.0	2,578.0
Pastured Cropland	749.0	1,316.0	1,383.0	1,450.0
Permanent Pasture	911.0	1,072.0	1,126.0	1,178.0
Other	807.0	734.0	752.0	787.0
Commercial Fisheries3/	(10.7)	(14.0)	(20.0)	(26.0)
Minerals3/	(7.0)	(11.0)	(16.0)	(24.0)
Recreation				
Class A4/	(1.3)	(7.5)	(10.6)	(15.1)
Class B5/	(1.0)	(6.4)	(9.1)	(13.0)
Fish and Wildlife				
(Cropland)6/	-	(829.0)	(1,216.0)	(1,636.0)
(Pastureland) 5/	-	(153.0)	(172.0)	(202.0)
(Wetlands)3/	-	(144.0)	(162.0)	(190.0)
Environmental Quality				
Open and Green Space7/	(1.3)	(12.0)	(12.0)	(12.0)
Beaches and Shores3/	-	(16.0)	(16.0)	(16.0)
Botanical Systems3/	-	(500.0)	(500.0)	(500.0)
Geological Systems3/	-	(3.0)	(3.0)	(3.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	3,442.0	1,932.0	1,779.0	1,577.0
Animal roughage (Pasture) 1/	(383.0)	(677.0)	(711.0)	(751.0)
Recreation				
Class B 1/	(0.9)	(6.5)	(9.2)	(13.0)
Class C 1/	(0.2)	(0.6)	(0.9)	(1.1)
Fish and Wildlife2/	(690.2)	(717.2)	(836.9)	(1,007.7)
Environmental Quality				
Botanical Systems1/	-	(290.0)	(290.0)	(290.0)
Bottomland Hardwood Areas1/	(1,324.0)	(1,080.0)	(1,080.0)	(1,080.0)
Geological Systems1/	-	(3.0)	(3.0)	(3.0)
Lake Shores1/	-	(3.0)	(3.0)	(3.0)
Scenic River Banks1/	-	(9.0)	(9.0)	(9.0)
Wetlands1/		(121.0)	(121.0)	(121.0)
Wilderness Areas1/	-	(555.0)	(555.0)	(555.0)
Land Covered by Water				
Large Water Areas	400.0	402.0	438.0	488.0
Small Water Areas	138.0	138.0	138.0	138.0
Total Area, WRPA 9	8,510.0	8,510.0	8,510.0	8,510.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 10				
Open Land				
Transportation, Urban and Built-up	230.0	260.0	327.0	419.0
Food and Fiber				
Cropland	310.0	271.0	250.0	242.0
Pastured Cropland	49.0	90.0	95.0	100.0
Permanent Pasture	202.0	295.0	308.0	324.0
Other	1,681.0	1,671.0	1,664.0	1,653.0
Commercial Fisheries3/	(1.2)	(2.0)	(3.0)	(3.0)
Minerals3/	(14.0)	(17.0)	(23.0)	(30.0)
Recreation				
Class A4/	(1.3)	(14.4)	(23.0)	(36.3)
Class B5/	(0.9)	(12.4)	(19.8)	(31.2)
Fish and Wildlife				
(Cropland)6/	-	(271.0)	(250.0)	(242.0)
(Pastureland)5/	-	(291.0)	(372.0)	(424.0)
(Wetlands)3/	-	(275.0)	(353.0)	(530.0)
Environmental Quality				
Open and Green Space7/	(1.3)	(31.0)	(31.0)	(31.0)
Beaches and Shores3/	-	(160.0)	(160.0)	(160.0)
Forest Land				
Food and Fiber	-	-	-	-
Forest Products, et al.	1,317.0	1,202.0	1,142.0	1,041.0
Animal roughage (Pasture)1/	(32.0)	(59.0)	(62.0)	(65.0)
Recreation				
Class B 1/	(0.8)	(12.5)	(19.8)	(31.2)
Class C 1/	(0.0)	(1.2)	(1.8)	(2.7)
Fish and Wildlife2/	(185.3)	(196.3)	(229.1)	(275.8)
Environmental Quality				
Botanical Systems1/	-	(1.0)	(1.0)	(1.0)
Bottomland Hardwood Areas1/	(970.0)	(885.0)	(841.0)	(780.0)
Lake Shores1/	-	(4.0)	(4.0)	(4.0)
Scenic River Banks 1/	-	(4.0)	(4.0)	(4.0)
Land Covered by Water				
Large Water Areas	939.0	939.0	942.0	949.0
Small Water Areas	219.0	219.0	219.0	219.0
Total Area, WRPA 10	4,947.0	4,947.0	4,947.0	4,947.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future (Land Use (1,000 Acres) 1980	2000	2020
WRPA's 1 through 10				
Open Land				
Transportation				
Urban and Built-up	2,332.0	2,481.0	2,898.0	3,553.0
Food and Fiber				
Cropland	17,343.0	19,203.0	20,374.0	21,075.0
Pastured Cropland	2,871.0	5,054.0	5,434.0	5,778.0
Permanent Pasture	6,782.0	6,962.0	7,553.0	8,086.0
Other	3,506.0	3,915.0	3,718.0	3,478.0
Commercial Fisheries 3/	(46.0)	(70.0)	(117.0)	(164.0)
Minerals 3/	(67.0)	(87.0)	(127.0)	(183.0)
Recreation				
Class A 4/	(16.4)	(62.0)	(94.0)	(145.5)
Class B 5/	(16.0)	(54.5)	(80.8)	(124.6)
Fish and Wildlife				
(Cropland) 6/		(3,100.0)	(3,807.0)	(4,817.0)
(Pastureland) 5/		(1,329.0)	(1,629.0)	(2,064.0)
(Wetlands) 3/		(658.0)	(754.0)	(959.0)
Environmental Quality				
Open and Green Space 7/	(16.4)	(122.0)	(122.0)	(122.0)
Beaches and Shores 3/	-	(176.0)	(176.0)	(176.0)
Botanical Systems	-	(502.0) 9/	(502.0) 9/	(502.0) 9/
Ecological Systems 8/	-	1.0	1.0	1.0
Geological Systems		(161.0)	(161.0)	(161.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	29,637.0	24,477.0	21,634.0	18,192.0
Animal Roughage (Pasture) 1/	(4,207.0)	(5,993.0)	(6,560.0)	(7,033.0)
Recreation				
Class B	(15.9)	(55.0)	(81.3)	(125.0)
Class C	(50.9)	(54.2)	(70.1)	(101.8)
Fish and Wildlife				
Management Areas, etc. 1/	(2,021.4)	(2,466.4)	(2,856.2)	(3,418.2)
Wetlands 1/	-	(809.0)	(1,047.0)	(1,320.0)
Environmental Quality				
Botanical Systems 1/		(293.0)	(293.0)	(293.0)
Bottomland Hardwood Areas 1/	(10,852.0)	(9,453.0)	(8,946.0)	(8,402.0)
Ecological Systems 1/		(153.0)	(153.0)	(153.0)
Geological Systems 1/		(579.0)	(579.0)	(579.0)
Lake Shores 1/		(20.0)	(20.0)	(20.0)
Scenic River Banks 1/		(117.0)	(117.0)	(117.0)
Wetlands 1/		(185.0)	(185.0)	(185.0)
Wilderness Areas 1/		(659.0)	(659.0)	(659.0)
Land Covered by Water				
Large Water Areas	2,230.0	2,606.0	3,087.0	3,536.0
Small Water Areas	837.0	837.0	837.0	837.0
Total Area, LMR	65,538.0	65,538.0	65,538.0	65,538.0

Table 96 - Land Use Plan, Program A, Lower Mississippi Region (cont'd)

1/ Multiple-use land. Counted in forest products acreage.
2/ Primary use for fish and wildlife. Counted in forest products acreage.
3/ Multiple-use land. Counted in other open land acreage.
4/ Primary use for recreation. Counted in transportation, urban and built-up acreage.
5/ Multiple-use land counted in permanent pasture acreage.
6/ Multiple-use land. Counted in cropland acreage.
7/ Multiple-use with Class A recreation land. Counted in transportation, urban and built-up acreage.
8/ Exclusive use for environmental quality purposes. Not counted elsewhere.
9/ Exclusive use on 2,000 acres for environmental quality purposes. Remaining 500,000 acres are multiple-use and counted in other open land acreage.

Part of the land allocated to urban and built-up uses is required for recreation and environmental quality purposes. Regionally, such lands in the year 2020 amount to 145,500 acres, or 4 percent of the total urban and built-up acreage. On a WRPA basis, the urban lands allocated to multiple-use for recreation and environmental quality vary from a minimum of 3,000 acres in WRPA's 6 and 7 to a maximum of 39,000 acres in WRPA 3, wherein lies the city of Memphis, Tennessee. In WRPA 10, needs for open and green space in the city of New Orleans, Louisiana, account largely for the allocation of 36,000 acres of recreation land in that area in the year 2020.

Cropland. Cropland acreages as allocated in table 96 will maintain a slight steady increase (less than 1 percent per year) throughout the 50-year period of study. Yields will increase also and will sustain the region's doubling population. This is due in part to foreseeable improvements in agricultural technology and land management, and in part to shifts in land use. Individual WRPA's will exhibit slight changes, some increasing and others decreasing moderately. The needed increases in cropland can be achieved in most WRPA's by the intra-WRPA conversion of other types of open land or forest lands suitable for continuous cropping (Land Classes I through IV). The lands most likely to be converted are the forest lands, except for unusual cases where diminishing future needs for some types of open land will permit shifts from those lands. In WRPA's 2 and 3, for example, predicted needs for permanent pasture will decrease 379,000 and 428,000 acres, respectively, between now and 1980, thereby allowing a major shift from pastureland to cropland. Lesser shifts of the same sort will be possible in WRPA's 5, 6, and 8 in 1980. Beyond 1980, however, needs for pastureland will continually increase throughout the region and there will be no pastureland readily available for conversion to cropland (assuming that pastureland needs will be met).

Of further significance in the cropland allocation is the anomaly that cropland use in WRPA 6 cannot reasonably be increased after 1980 due to physical, economical, and environmental constraints associated with forest land conversion. This means that there will be a cropland deficit in WRPA 6 beginning in 1980. But this deficit disappears when WRPA's 5 and 6 are viewed as a single planning entity, allowing a combined allocation to cropland equaling the combined need. Cropland deficits in WRPA 4 can be similarly offset by using the available land resources in WRPA 7. Hence, the cropland allocation for the National Income Program is such that all WRPA needs for all time frames can be satisfied.

The multiple-use of lands allocated to crop production will be required throughout the study period, not only to satisfy food and fiber needs, but also to satisfy needs for wildlife oriented recreation. In WRPA's 8 and 10 the multi-needs for cropland will outgrow the cropland resource before the year 1980. This does not mean that there will be a cropland shortage in those areas. It does mean, however, that wildlife

oriented recreation needs for cropland in Louisiana will have to be satisfied on a State-wide basis, with resources west of the Mississippi River (in WRPA's 5, 6, and 9) contributing to the satisfaction of needs that arise in the southeastern part of the State.

Pastureland. Pastured cropland, permanent pasture, and pastured forest should collectively increase 51 percent over the study period with most WRPA's following the regional trend. This takes into account the atypical short-term decrease in permanent pasture in some WRPA's. The future need for pastured forest (table 44, page 104) can be satisfied on a regional basis on lands allocated to satisfaction of forest products needs. The forest resource has the capability to provide required livestock reoughage throughout the period of study but, as with cropland, it will be necessary to intensify forest pasturage in certain WRPA's to offset pasture deficits which will surface in WRPA's 4 and 7 in the late 1900's and continue thereafter. WRPA 3 forest resources can satisfy the initial deficit in WRPA 4; however, to satisfy the 2020 need will require a shift to WRPA's 1, 2, and 6. Similarly, WRPA 8 can satisfy the initial deficit in WRPA 7, but satisfaction of the 2020 need will require shifts to WRPA's 1 and 5 as well as additional shifts to WRPA 8. On a regional basis, the pasturage of about 1 out of every 3 acres of forest land will be required to satisfy needs in the year 2020. No special action is planned to insure either the continued pasturage of forest lands or the above described shifts in pastured forest. The shifts are reflected, however, in the land allocations given in table 96.

Also reflected in table 96 is the multiple-use of pasturelands for satisfying recreation and wildlife needs. Such use will apply to about one-fourth of the region's combined permanent pasture and pastured cropland in the year 2020, with the heaviest pressure on the resources being exerted in southeastern Louisiana in WRPA 10. There, intrastate rather than intra-WRPA resource use will be required for needs satisfaction on multiple-use pasturelands. In other WRPA's, this problem is not expected to arise because multiple-use requirements for pasture in the year 2020 generally amount to less than 30 percent of the WRPA pastureland allocations and range downward to as low as 2 percent in WRPA 7.

Other Land. Regionwide, "other" lands will decline only 1 percent between 1970 and 2020. Individual WRPA's, however, exhibit wide fluctuations - from minus 60 percent to plus 77 percent. The increases will occur only in WRPA's 3, 5, and 6. Within the other lands in all WRPA's are multiple-use acreages allocated to the satisfaction of needs for commercial fisheries and minerals production. Also included in some WRPA's are wetlands that contribute to needs satisfaction for fish and wildlife. Further included are beaches and shores, botanical systems, and geological systems that contribute to the environmental quality of the region. The multiple-use acreages are identified in table 96.

Forest land. Allocated forest acreages will decline by 10.4 million acres due to the allocation of lands to satisfy high priority needs. All

WRPA's will contribute to the regional loss. In WRPA 4 the forest land acreage in 2020 will be composed of the now existing public forests, stands of bottom-land hardwoods that cannot be cleared because of economic restraints, ownership arrangements, or other reasons, and certain tracts of other forests (upland hardwood, pine-hardwood, pine, etc.) covering lands that cannot reasonably be converted to cropland or other primary uses due to underlying soil properties or other limiting factors. The same type of condition will exist in WRPA 6 within the next decade.

The allocated 19.2 million acres of forest in the region in the year 2020 will occupy about 1 out of every 3 acres of the region's land and will equal 89 percent of the forest land needed at that time in the food and fiber account. Deficits will occur in six WRPA's. These deficits will average 634,000 acres per WRPA and will range from a minimum of 175,000 acres in WRPA 3 to a maximum of 1.9 million acres in WRPA 5. The planning areas with adequate forest land to satisfy their own future needs are WRPA's 1, 2, 9, and 10.

While recognizing the potential of forest resources in WRPA's 2, 9, and 10 to allay to some extent the regional deficit depicted for the year 2020, it should also be recognized that the deficit may, in fact, be overstated or imaginary. This is because the land allocation shown in table 94 does not fully reflect the impact of future water resources developments in the region. Such developments, including flood control and drainage projects, will help provide for satisfaction of the region's agricultural production requirements on less than the allocated acreage, thereby allowing the allocation of more acreage to forest. This matter is discussed in more detail in a later section of the appendix.

Another matter of importance in the forest-land allocation centers around the need for multiple-use of wooded areas to satisfy not only the requirements for timber products but also the requirements for recreation, fish and wildlife habitat, and environmental quality. Recreational use of the forest land is expected to increase from 109,000 acres in 1980 to 227,000 acres in the year 2020. Primary use of the forests for fish and wildlife purposes is likewise expected to increase. In 1970 approximately 2 million acres of forest were used primarily for fish and wildlife. The allocated primary-use acreage for this purpose in the year 2020 amounts to 3.4 million acres, with the remaining 15.8 million acres to serve fish and wildlife purposes on an ancillary basis. In terms of environmental quality, the regional allocation of forest land will permit the satisfaction of needs for approximately 9 million acres of land having unique botanical, ecological, geological, or other significant environmental features.

Commercial Fisheries Land and Mineral Land. As mentioned before, lands for commercial fisheries and minerals production are multiple-use with other land uses; as such, they were identified but not treated separately in the land allocation. Needs for commercial fisheries lands are expected to be satisfied through the use of the allocated open lands,

such as cropland and pastures. Likewise, it is expected that mineral needs will be satisfied through the use of lands allocated to urban and built-up, cropland, pasture, forest, and "other" lands, following the premise that minerals are where you find them and their extraction often does not displace other uses, as in the case of oil wells located in areas used primarily for permanent pasture. Some types of minerals extraction such as sand and gravel operations do materially detract from other uses of the land, but by and large the acreages required for all types of mineral extraction and for commercial fisheries are relatively insignificant when considered in light of the region's total land resource. More specifically, such acreages in the year 2020 will amount to only 347,000 acres, or about one-half of 1 percent of the regional land.

Recreation Land. Of the total of 498,000 acres of land allocated to recreation use in the year 2020, only 146,000 are viewed as being used primarily for recreation purposes. These are the Class A lands located in urban areas. They will serve environmental quality purposes as well as recreation purposes. The remaining 352,000 acres of land allocated to recreation purposes consist of the Class B and Class C lands. Class B lands in the allocation are equally divided between open lands and forested areas, and Class C lands are located entirely in forested areas.

Fish and Wildlife Land. To meet future needs for wildlife oriented recreation will require that multiple-use of the region's open lands (cropland, pasture, etc.) be increased from 4.4 million acres in 1980 to 6.9 million acres in the year 2020. Similarly, the satisfaction of needs for waterfowl habitat and hunting in the year 2020 will require the increasing multiple-use of wetlands, with 2.3 million acres being used in the year 2020. In the case of big game and upland game hunting and habitat requirements, the multiple-use of all the region's forests will be required by 1980. During the 1970's, about one-half million acres of forests will be added to the acreage used primarily for fish and wildlife. Nearly an additional million acres will be added by the year 2020.

Environmental Quality Land. Lands viewed as significant from an environmental quality standpoint comprise 12.4 million acres, or 20 percent of the total land area of the region. All but 960,000 acres of these lands are located in forested areas, consisting of 10.9 million acres of bottom-land hardwood forests and 594,000 acres of other forest types. The nonforested areas include significant geological features associated with 158,000 acres of pastureland and 3,000 acres of other open land. They also include 500,000 acres of botanical systems, 176,000 acres of beaches and shores, 122,000 acres or urban open and green space, and 1,000 acres of significant ecological systems.

While most of these lands will remain available for the enjoyment of future generations throughout the study period, positive measures

will be required to protect certain areas. Such measures (see table 97) are an integral part of the National Income Program.

Land Covered by Water. Regionwide, large water acreage (lakes in excess of 40 acres in size) will increase roughly 58 percent, while small water acreage (lakes 2 acres to 40 acres in size) will increase an undetermined amount during the study period. The large water acreages are appropriately deducted from the land-resource base prior to allocation for forest requirements because of the capability of these water areas to satisfy a multiplicity of uses such as recreation, fish and wildlife, flood control, land treatment, sediment and erosion control, irrigation, navigation, and aesthetics. Future additions to small water areas will be mostly in the form of farm ponds constructed in pastureland areas. Such additions will require insignificant amounts of land relative to other uses, and have not been explicitly identified in the land allocation.

Land Use Measures. As stated at the outset of this discussion, Program A measures for future land use are limited to those necessary to insure the availability of land for recreation, fish and wildlife, and environmental quality purposes. A summary of the measures is given in table 97.

Effectiveness of Land Use Plan. The use of the land resources as summarized earlier in table 96 will provide for the regional satisfaction of all needs for urban and built-up space and for food and fiber production through the year 1980. At the same time, it will provide for the satisfaction of all needs for recreation and fish and wildlife, and all needs for environmental quality purposes, except for a minor portion of bottom-land hardwood forests that are specified as needs under the environmental quality objective. Beyond 1980, however, the allocation of lands to completely satisfy high priority needs for food and fiber production and related activities on open lands, will cause a widening disparity between forest availability and forest needs.

In the case of forest lands specified as needed for fish and wildlife purposes, all needs for wildlife management areas, etc., can be met throughout the study period. However, the post-1980 disparity between total forest resource needs and availability will reach 14.8 million acres by the year 2020. To completely satisfy the expressed fish and wildlife needs for forest land, even with intensive management of all woodlands, would require not only the preservation of every forested acre now existing in the region, but also the conversion to forest land of an additional 4.4 million acres of land needed for food and fiber production or other high priority purposes.

Expressed needs for forest lands to meet food and fiber production requirements exceed the allocated acreage by 1.4 million acres in year 2000, and 2.4 million acres in the year 2020. However, these apparent deficits should be offset by the beneficial impacts of future water

Table 97 - Program A, Measures Used to Meet Land Area Needs, Lower Mississippi Region

Water Resources Planning Area and Need Category	Time Frame and Incremental Program Measures		
	1970-1980	1980-2000[1]	2000-2020[1]
WRPA 2			
Recreation			
Class A[2]	Acquire, develop and maintain 1,000 acres.	Acquire, develop and maintain 1,300 acres.	Acquire, develop and maintain 3,700 acres.
Class B[3]	Acquire, develop and maintain 1,000 acres.	None.	Acquire, develop and maintain 5,700 acres.
Class C[4]	None	Acquire, provide access, and maintain 100 acres.	Acquire, provide access, and maintain 200 acres.
Fish and Wildlife	Purchase and maintain 64,000 acres; acquire easements and maintain 40,000 acres.	Purchase and maintain 63,600 acres.	Purchase and maintain 90,700 acres.
Environmental Quality	Purchase and maintain 1,000 acres of pasture, purchase and maintain 2,000 acres of forest, and regulate land use on 4,000 acres of forest to preserve ecological systems.	Maintain 1970-1980 measures.	Maintain 1980-2000 measures.
WRPA 3			
Recreation			
Class A[2]	Provide access, develop and maintain 7,600 acres; acquire, develop and maintain 3,300 acres.	Provide access, develop and maintain 6,800 acres; acquire, develop and maintain 2,900 acres.	Provide access, develop and maintain 10,900 acres; acquire, develop and maintain 4,600 acres
Class B[3]	Provide access, develop and maintain 16,300 acres; acquire, develop and maintain 1,800 acres.	Provide access, develop and maintain 15,900 acres; acquire, develop and maintain 1,800 acres.	Provide access, develop and maintain 7,800 acres; acquire, develop and maintain 18,900 acres.
Class C[4]	Provide access and maintain 1,000 acres.	Provide access and maintain 700 acres.	Provide access and maintain 1,100 acres.
Fish and Wildlife	Purchase and maintain 57,200 acres.	Purchase and maintain 38,100 acres.	Purchase and maintain 54,300 acres.
Environmental Quality	Purchase and maintain 20,200 acres of urban land.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 4			
Recreation			
Class A[2]	Provide access, develop and maintain 2,400 acres; acquire, develop and maintain 600 acres.	Provide access, develop and maintain 1,300 acres; acquire, develop and maintain 300 acres.	Provide access, develop and maintain 500 acres; acquire, develop and maintain 2,100 acres.
Class B[3]	Provide access, develop and maintain 3,400 acres; acquire, develop and maintain 900 acres.	Provide access, develop and maintain 2,100 acres; acquire, develop and maintain 500 acres.	Provide access, develop and maintain 3,400 acres; acquire, develop and maintain 800 acres.
Class C[4]	None	Provide access and maintain 5,600 acres.	Provide access and maintain 13,400 acres.
Fish and Wildlife	Purchase and maintain 92,200 acres.	Purchase and maintain 43,000 acres.	Purchase and maintain 61,300 acres.
Environmental Quality	Purchase and maintain 4,200 acres of urban land; purchase and maintain 4,000 acres of bottomland hardwood forest to preserve ecological systems.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.

Table 97 - Program A, Measures Used to Meet Land Area Needs, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	Time Frame and Incremental Program Measures 1970-1980	1980-2000[1/]	2000-2020[1/]
WRPA 5			
Recreation			
Class A[2/]	Provide access, develop and maintain 2,500 acres; acquire, develop and maintain 1,000 acres.	Provide access, develop and maintain 2,100 acres; acquire, develop and maintain 900 acres.	Provide access, develop and maintain 3,000 acres; acquire, develop and maintain 1,400 acres.
Class B[3/]	Provide access, develop and maintain 5,400 acres; acquire, develop and maintain 600 acres.	Provide access, develop and maintain 4,500 acres; acquire, develop and maintain 500 acres.	Provide access, develop and maintain 6,600 acres; acquire, develop and maintain 1,000 acres.
Class 4[4/]	None	Provide access and maintain 7,700 acres.	Provide access and maintain 15,400 acres.
Fish and Wildlife	Purchase and maintain 103,500 acres.	Purchase and maintain 60,400 acres.	Purchase and maintain 86,200 acres
Environmental Quality	Purchase and maintain 6,900 acres of urban land; purchase and maintain 5,000 acres of bottomland hardwood forest to preserve ecological systems.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 6			
Recreation			
Class A[2/]	Provide access, develop and maintain 1,100 acres; acquire, develop and maintain 100 acres.	Provide access, develop and maintain 400 acres; acquire, develop and maintain 100 acres.	Provide access, develop and maintain 700 acres.
Class B[3/]	Provide access, develop and maintain 2,100 acres; acquire, develop and maintain 200 acres.	Provide access, develop and maintain 800 acres.	Provide access, develop and maintain 1,100 acres; acquire, develop and maintain 200 acres.
Class C[4/]	Acquire, provide access and maintain 200 acres.	None.	None.
Fish and Wildlife	Purchase and maintain 25,000 acres.	Purchase and maintain 11,700 acres.	Purchase and maintain 16,700 acres.
Environmental Quality	Purchase and maintain 300 acres of urban land; purchase and maintain 100 acres to preserve botanical system.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 7			
Recreation			
Class A[2/]	Provide access, develop and maintain 1,100 acres; acquire, develop and maintain 100 acres.	Provide access, develop and maintain 600 acres.	Provide access, develop and maintain 1,000 acres; acquire, develop and maintain 100 acres.
Class B[3/]	Provide access, develop and maintain 1,800 acres; acquire, develop and maintain 200 acres.	Provide access, develop and maintain 1,100 acres; acquire, develop and maintain 100 acres.	Provide access, develop and maintain 1,600 acres; acquire, develop and maintain 200 acres
Class C[4/]	None	Provide access and maintain 100 acres.	Provide access and maintain 100 acres.
Fish and Wildlife	Purchase and maintain 30,000 acres.	Purchase and maintain 17,400 acres.	Purchase and maintain 24,700 acres.
Environmental Quality	Purchase and maintain 10,000 acres of bottomland hardwood forest to preserve ecological systems.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.

Table 97 - Program A, Measures Used to Meet Land Area Needs, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	Time Frame and Incremental Program Measures 1970-1980	1980-2000[1]	2000-2020[1]
WRPA 8			
Recreation			
Class A[2]	Develop and maintain 100 acres; provide access, develop and maintain 2,400 acres; acquire, develop and maintain 3,000 acres.	Acquire, develop and maintain 3,600 acres.	Acquire, develop and maintain 5,700 acres.
Class B[3]	Provide access, develop and maintain 5,700 acres; acquire, develop and maintain 3,000 acres.	Acquire, develop and maintain 6,200 acres.	Acquire, develop and maintain 9,700 acres.
Class C[4]	Acquire, provide access and maintain 500 acres.	Acquire, provide access and maintain 300 acres.	Acquire, provide access and maintain 400 acres.
Fish and Wildlife	Purchase and maintain 14,000 acres.	Purchase and maintain 3,200 acres.	Purchase and maintain 4,500 acres.
Environmental Quality	Purchase and maintain 6,000 acres of urban land; purchase and maintain 100 acres, and provide land-owner subsidy on 1,800 acres to preserve botanical systems.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 9			
Recreation			
Class A[2]	Develop and maintain 200 acres; provide access, develop and maintain 1,300 acres; acquire, develop and maintain 4,700 acres.	Acquire, develop and maintain 3,100 acres.	Acquire, develop and maintain 4,500 acres.
Class B[3]	Provide access, develop and maintain 10,800 acres; acquire, develop and maintain 200 acres.	Acquire, develop and maintain 5,400 acres.	Acquire, develop and maintain 7,700 acres.
Class C[4]	Provide access and maintain 400 acres.	Provide access and maintain 300 acres.	Provide access and maintain 200 acres.
Fish and Wildlife	Purchase and maintain 27,000 acres.	Purchase and maintain 119,700 acres.	Purchase and maintain 170,800 acres.
Environmental Quality	Purchase and maintain 4,500 acres of urban land; acquire easement on 5,000 acres of bottomland hard-wood forest to preserve wetlands.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.
WRPA 10			
Recreation			
Class A[2]	Develop and maintain 100 acres; provide access, develop and maintain 2,000 acres; acquire, develop and maintain 11,000 acres.	Acquire, develop and maintain 8,600 acres.	Acquire, develop and maintain 13,300 acres.
Class B[3]	Provide access, develop and maintain 6,300 acres; acquire, develop and maintain 16,900 acres.	Acquire, develop and maintain 14,700 acres.	Acquire, develop and maintain 22,800 acres.
Class C[4]	Provide access and maintain 100 acres; acquire, pro-vide access and maintain 1,100 acres.	Acquire, provide access and maintain 600 acres.	Acquire, provide access and maintain 900 acres.
Fish and Wildlife	Purchase and maintain 11,000 acres.	Purchase and maintain 32,800 acres.	Purchase and maintain 46,700 acres.
Environmental Quality	Purchase and maintain 16,600 acres of urban land; purchase and maintain 1,000 acres of bottomland hardwood forest to preserve botanical systems.	Maintain 1970-1980 measures.	Maintain 1970-1980 measures.

1/ Where not specified, measures in addition to those listed include operation and maintenance of facilities developed in previous time frames.
2/ Urban land.
3/ Divided equally between open land and forest land.
4/ Forest land.

resources developments, as discussed on page 411. It is estimated that such development would reduce needs for the allocated open lands (table 96) by 1.5 and 2.5 million acres in the years 2000 and 2020, respectively. Reallocation of these acreages to forest land would, in turn, provide for complete satisfaction of food and fiber needs throughout the study period. Table 98 gives a WRPA breakdown of the land needs that can be satisfied within the land use allocation.

Fruition of the National Income Program is in many ways contingent upon efficient management of the region's land resources. Even with an active educational program, and changes in present institutional arrangements, farmers are not likely to change management practices to allow short-term attainment of required crop production on the allocated acreages. However, irrigation as an intensified management practice (not included in the cropland budgeting model), as discussed in the water withdrawal plan, will tend to partly offset this and other inefficiencies. Additionally, flood control and drainage programs will help to increase agricultural production by reducing flood losses, thereby further balancing the time lag in realization of the sought for cropping pattern. Adjustments in the land use plan which stem from further development for flood control and related measures are displayed and discussed in a later section dealing with program impacts (pages 406 to 412). Allocations in some land-use categories other than cropland were based on needs adjusted to reflect near optimum land management levels for comparability with the cropland model assumptions. Indeed, efficient management of all agricultural land (including forest land) is essential if required production levels are to be reached.

Recreation Plan

The National Income plan for recreation provides for satisfaction of future needs for both water and land areas. The plan is summarized in table 99. It includes measures which provide maximum site development of existing areas as well as acquisition of additional areas. The plan provides for: (1) maximum utilization of the region's existing 1.9 million acres of water areas in accessible locations and otherwise suitable for use by recreationists; (2) recreation use of about 257,000 acres of water surface that will be created primarily for flood control, power, water supply, or some other purpose; (3) more intensive use of 190,900 acres of the region's lands either by provision of facilities or access and facilities; (4) acquisition and development of 206,300 acres of land expressly for recreation development; and (5) creation of 766,000 acres of new water surface expressly for recreational purposes.

The National Income recreation plan has the capability of satisfying needs as demonstrated in table 100. Where less than 100 percent of the recreation needs are met within the plan, there are physical constraints imposed by the limited potential for developing lakes larger than 500 acres in size. These physical constraints could not be overcome.

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1/		
	1980	2000	2020
WRPA 1			
Open Land			
Transportation, Urban and Built-up	-	-	-
Food and Fiber			
Cropland	100	100	100
Pastured Cropland	100	100	100
Permanent Pasture	100	100	100
Other	100	100	100
Commercial Fisheries	-	-	-
Minerals	-	-	-
Recreation			
Class A	-	-	-
Class B	-	-	-
Fish and Wildlife			
(Cropland)	-	-	-
(Pastureland)	-	-	-
(Wetlands)	-	-	-
Environmental Quality	-	-	-
Forest Land			
Food and Fiber			
Forest Products, et al.	100	100	100
Animal Roughage (pasture)	100	100	273 2/
Recreation			
Class B	-	-	-
Class C	-	-	-
Fish and Wildlife	100	100	100
Environmental Quality			
Bottomland Hardwood Areas	100	100	100
Lake Shores	100	100	100
Land Covered by Water			
Large Water Areas	100	100	100
Small Water Areas			

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied		
	1980	2000	2020
WRPA 2			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	100
Pastured Cropland	100	100	100
Permanent Pasture	100	100	1-0
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A 3/	100	100	100
Class B 3/	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
(Wetlands) 4/	69	63	53
Environmental Quality			
Open and Green Space 3/	100	100	100
Ecological Systems 3/	100	100	100
Geological Systems	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	96	115	124
Animal Roughage (pasture)	100	100	167
Recreation			
Class B 3/	100	100	100
Class C 3/	100	100	100
Fish and Wildlife			
Total Woodland Habitat	84	61	45
Management Areas, etc. 3/	100	100	100
Environmental Quality			
Bottomland Hardwood Areas	61	47	39
Ecological Systems 3/	100	100	100
Geological Systems	100	100	100
Lake Shores 3/	100	100	100
Scenic River Banks 3/	100	100	100
Wilderness Areas	100	100	100
Land Covered by Water			
Large Water Areas 3/	100	92	80
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 3			
Open Land			
Transportation,			
Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	100
Pastured Cropland	100	100	100
Permanent Pasture	100	100	100
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A3/	100	100	100
Class B3/	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
(Wetlands)4/	12	9	7
Environmental Quality3/	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	119	105	83
Animal Roughage (pasture)	100	180	100
Recreation			
Class B3/	100	100	100
Class C3/	100	100	100
Fish and Wildlife			
Total Woodland Habitat	45	24	10
Management Areas, etc.	100	100	100
Environmental Quality			
Bottomland Hardwood Areas	88	63	56
Lake Shores3/	100	100	100
Scenic River Banks3/	100	100	100
Wetlands	100	100	100
Land Covered by Water			
Large Water Areas3/	100	99	81
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 4			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	99 4/
Pastured Cropland	100	76 4/	65 4/
Permanent Pasture	100	73 4/	65 4/
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A 3/	100	100	100
Class B 3/	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
(Wetlands) 4/	65	58	49
Environmental Quality 3/	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	76	72	87
Animal Roughage (Pasture)	100	68	56
Recreation			
Class B 3/	100	100	100
Class C 3/	100	100	100
Fish and Wildlife			
Total Woodland Habitat	86	58	45
Management Areas, etc. 3/	100	100	100
Environmental Quality			
Bottomland Hardwood Areas	82	82	82
Ecological Systems 3/	100	100	100
Lake Shores	100	100	100
Wilderness Areas	100	100	100
Land Covered by Water			
Large Water Areas 3/	100	100	87
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 5			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland[2/]	124	151	196
Pastured Cropland[3/]	111	112	113
Permanent Pasture	100	102[2/]	105[2/]
Other[2/]	130	137	158
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A[3/]	100	100	100
Class B[3/]	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
Environmental Quality[3/]	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	98	98	82
Animal Roughage (Pasture)	100	100	133
Recreation			
Class B[3/]	100	100	100
Class C[3/]	100	100	100
Fish and Wildlife			
Total Woodland Habitat	353	291	224
Management Areas, etc.[3/]	100	100	100
Wetlands[3/]	267	305	272
Environmental Quality			
Bottomland Hardwood Areas	96	93	88
Ecological Systems[3/]	100	100	100
Geological Systems	100	100	100
Lake Shores[3/]	100	100	100
Scenic River Banks[3/]	100	100	100
Wilderness Areas[3/]	100	100	100
Land Covered by Water			
Large Water Areas	100	100	100
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 6			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland[4/]	94	88	79
Pastured Cropland[4/]	69	66	63
Permanent Pasture	100	96[4/]	91[4/]
Other[4/]	37	34	30
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A[3/]	100	100	100
Class B[3/]	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
Environmental Quality			
Open and Green Space[3/]	100	100	100
Botanical Systems[3/]	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	65	72	72
Animal Roughage (Pasture)	100	100	169
Recreation			
Class B[3/]	100	100	100
Class C[3/]	100	100	100
Fish and Wildlife			
Total Woodland Habitat	112	110	99
Management Areas, etc.[3/]	100	100	100
Wetlands[3/]	202	202	185
Environmental Quality			
Bottomland Hardwood Areas	81	81	81
Land Covered by Water			
Large Water Areas	100	100	93
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 7			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	163 2/
Pastured Cropland	100	146 2/	168 2/
Permanent Pasture	100	149 2/	162 2/
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A 3/	100	100	100
Class B 3/	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
Environmental Quality 3/	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	121	75	50
Animal Roughage (Pasture)	100	63 4/	37 4/
Recreation			
Class B 3/	100	100	100
Class C 3/	100	100	100
Fish and Wildlife			
Total Woodland Habitat	441	228	123
Management Areas, etc. 3/	100	100	100
Wetlands 2/	126	111	92
Environmental Quality			
Bottomland Hardwood Areas	93	81	81
Ecological Systems 3/	100	100	100
Geological Systems	100	100	100
Lake Shores 3/	100	100	100
Scenic River Banks 3/	100	100	100
Wilderness Areas 3/	100	100	100
Land Covered by Water			
Large Water Areas	100	100	100
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 8			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	100
Pastured Cropland	100	100	100
Permanent Pasture	100	100	100
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A	100	100	100
Class B	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	129 2/
Environmental Quality			
Open and Green Space 3/	100	100	100
Botanical Systems 3/	100	100	100
Geological Systems	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	97	94	84
Animal Roughage (Pasture)	100	182 2/	176 2/
Recreation			
Class B	100	100	100
Class C	100	100	100
Fish and Wildlife			
Total Woodland Habitat	104	79	56
Management Areas, etc. 3/	100	100	100
Wetlands	100	103 2/	165 2/
Environmental Quality			
Botanical Systems 3/	100	100	100
Bottomland Hardwood Areas	93	90	82
Geological Systems	100	100	100
Lake Shores 3/	100	100	100
Scenic River Banks 3/	100	100	100
Land Covered by Water			
Large Water Areas	100	100	100
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 9			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	100
Pastured Cropland	100	100	100
Permanent Pasture	100	100	100
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A3/	100	100	100
Class B3/	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
(Wetlands)	100	100	100
Environmental Quality			
Open and Green Space3/	100	100	100
Beaches and Shores	100	100	100
Botanical Systems	100	100	100
Geological Systems	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	105	127	155
Animal Roughage (Pasture)	100	100	100
Recreation			
Class B	100	100	100
Class C	100	100	100
Fish and Wildlife			
Total Woodland Habitat	77	63	48
Management Areas, etc.	100	100	100
Environmental Quality			
Botanical Systems	100	100	100
Bottomland Hardwood Areas	82	82	82
Geological Systems	100	100	100
Lake Shores3/	100	100	100
Scenic River Banks3/	100	100	100
Wetlands3/	100	100	100
Wilderness Areas3/	100	100	100
Land Covered by Water			
Large Water Areas3/	100	100	100
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA 10			
Open Land			
Transportation,			
Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	100
Pastured Cropland	100	100	100
Permanent Pasture	100	100	100
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A3/	100	100	100
Class B3/	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	88
(Wetlands)	100	100	116
Environmental Quality			
Open and Green Space3/	100	100	100
Beaches and Shores	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	162	213	228
Animal Roughage (Pasture)	100	100	100
Recreation			
Class B3/	100	100	100
Class C3/	100	100	100
Fish and Wildlife			
Total Woodland Habitat	25	19	13
Management Areas, etc.3/	100	100	100
Environmental Quality			
Botanical Systems3/	100	100	100
Bottomland Hardwood Areas	91	87	80
Lake Shores3/	100	100	100
Scenic River Banks3/	100	100	100
Lands Covered by Water			
Large Water Areas3/	100	100	100
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	Percent of Need Satisfied 1980	2000	2020
WRPA's 1 - 10			
Open Land			
Transportation, Urban and Built-up	100	100	100
Food and Fiber			
Cropland	100	100	100
Pastured Cropland	100	100	100
Permanent Pasture	100	100	100
Other	100	100	100
Commercial Fisheries	100	100	100
Minerals	100	100	100
Recreation			
Class A3/	100	100	100
Class B3/	100	100	100
Fish and Wildlife			
(Cropland)	100	100	100
(Pastureland)	100	100	100
(Wetlands)	100	100	100
Environmental Quality			
Open and Green Space3/	100	100	100
Beaches and Shores	100	100	100
Botanical Systems	100	100	100
Ecological Systems	100	100	100
Geological Systems	100	100	100
Forest Land			
Food and Fiber			
Forest Products, et al.	100	94	89
Animal Roughage (Pasture)	100	100	100
Recreation			
Class B	100	100	100
Class C	100	100	100
Fish and Wildlife			
Total Woodland Habitat	112	81	56
Management Areas, etc.	100	100	100
Wetlands	100	100	100
Environmental Quality			
Botanical Systems	100	100	100
Bottomland Hardwood Areas	89	84	78
Ecological Systems	100	100	100
Geological Systems	100	100	100
Lake Shores	100	100	100
Scenic River Banks -	100	100	100
Wetlands	100	100	100
Wilderness Areas	100	100	100
Land Covered by Water			
Large Water Areas	100	100	100
Small Water Areas	100	100	100

Table 98 - Effectiveness of Land Use Plan, Program A, Lower Mississippi Region (cont'd)

1/ Percentages based on ratio of land allocated (or available) to land needed.

2/ Land Resources allocated in part to satisfy portion of needs in bordering WRPA's.

3/ Program measures required for all or part of needs satisfaction.

4/ Remaining needs met on a regional basis by allocation of land resources in bordering WRPA's.

Table 99 - Recreation Plan, National Income Objective, Lower Mississippi Region

		Water Areas															
		Large Recreation Lakes (1,000 Acres)1/								Small Recreation Lakes (1,000 Acres)2/							
				Needs Satisfaction3/								Needs Satisfaction2/					
						New Reservoir Construction4/								New Reservoir Construction			
WRPA	Time Frame	Available Resource	Resource Needed	Intra-WRPA Use5/	Inter-WRPA Commuting6/	Single Purpose	Multi-Purpose	Sub-total	Total	Available Resource	Resource Needed	Intra-WRPA Use5/	Inter-WRPA Commuting	Single Purpose	Multi-Purpose	Sub-total	Total
2	1980	22	41	22	19	0	0	0	41	69	67	67	0	0	0	0	67
	2000		65	22	16	0	14	14	52		97	69	2	3	23	26	97
	2020		103	36	17	0	0	0	53		143	95	2	45	1	46	143
3	1980	4	92	4	17	69	2	71	92	36	153	36	3	70	44	114	153
	2000		182	75	17	87	0	87	179		271	150	2	98	21	119	271
	2020		333	162	17	0	0	0	179		461	269	2	173	17	190	461
4	1980	49	41	41	0	0	0	0	41	25	69	25	30	8	6	14	69
	2000		67	49	11	0	7	7	67		109	39	1	67	2	69	109
	2020		107	56	11	0	7	7	74		149	108	1	38	2	40	149
5	1980	175	56	56	0	0	0	0	56	0	92	92 6/	0	0	0	0	92
	2000		95	95	0	0	0	0	95		142	80 6/	62	0	0	0	142
	2020		157	157	0	0	0	0	157		217	18 6/	93	60	46	106	217
6	1980	10	12	10	2	0	0	0	12	22	19	19	0	0	0	0	19
	2000		17	10	7	0	0	0	17		26	22	2	2	0	2	26
	2020		25	10	11	0	0	0	21		36	24	2	10	0	10	36
7	1980	23	11	11	0	0	0	0	11	15	17	17 6/	0	0	0	0	17
	2000		18	18	0	0	0	0	18		25	20 6/	1	0	4	4	25
	2020		28	23	5	0	0	0	28		39	19	1	0	19	19	39
8	1980	51	40	40	0	0	0	0	40	22	67	33 6/	34	0	0	0	67
	2000		75	51	24	0	0	0	75		112	22	90	0	0	0	112
	2020		130	51	79	0	0	0	130		180	22	80	36	42	78	180
9	11980	316	50	50	0	0	0	0	50	84	83	83	0	0	0	0	83
	2000		82	82	0	0	0	0	82		122	122 6/	0	0	0	0	122
	2020		129	129	0	0	0	0	129		180	180 6/	0	0	0	0	180
10	1980	432	96	96	0	0	0	0	96	507	160	160	0	0	0	0	160
	2000		178	178	0	0	0	0	178		264	264	0	0	0	0	264
	2020		309	309	0	0	0	0	309		428	428	0	0	0	0	428
LMR	1980	1,082	439	330	38	69	2	71	439	780	727	532	67	78	50	128	727
	2000		779	580	75	87	21	108	763		1,168	788	160	170	50	220	1,168
	2020		1.321	933	140	0	7	7	1,080		1,833	1,163	181	362	127	489	1,833

1/ Water bodies larger than 500 acres.
2/ Water bodies between 40 and 500 acres.
3/ Program A measures for needs satisfaction consist of new construction. Associated public investments include costs of single-purpose recreation reservoirs and appropriate po: portion of costs of multi-purpose reservoirs.
4/ Limited by development potential of region (See table 102)
5/ Includes use of reservoirs constructed in previous time periods.
6/ Commuting to lakes in other WRPA's having surpluses of large water. Includes commuting to WRPA 1, which contains 368,000 acres of large water.

Table 99 - Recreation Plan, National Income Objective, Lower Mississippi Region (Cont'd)

WRPA	Time Frame	Water Areas: Total Recreation Lakes (1,000 Acres)		Needs Satisfaction[3]		New Reservoir Construction				Land Areas: Class A Land (1,000 Acres)	Proposed Development		
		Available Resource	Resource Needed	Intra-WRPA Use[5]	Inter-WRPA Commuting	Single Purpose	Multi-Purpose	Sub-total	Total	Existing Development[7]	Access & Facilities[8]	Acquisition & Facilities[9]	Subtotal[10]
2	1980	91	108	89	19	0	0	0	108	6.1	0.0	1.0	7.1
	2000		162	91	18	3	37	40	149		0.0	1.3	8.4
	2020		246	131	19	45	1	46	196		0.0	3.7	12.1
3	1980	40	245	40	20	139	46	185	245	2.9	7.6	3.3	13.8
	2000		453	225	19	185	21	206	450		6.8	2.9	23.5
	2020		794	431	19	173	17	190	640		10.9	4.6	39.0
4	1980	74	110	66	30	8	6	14	110	0.8	2.4	0.6	3.8
	2000		176	88	12	67	9	76	176		1.3	0.3	5.4
	2020		256	164	12	38	9	47	223		0.5	2.1	8.0
5	1980	175	148	148	0	0	0	0	148	2.6	2.5	1.0	6.1
	2000		237	175	62	0	0	0	237		2.1	0.9	9.1
	2020		374	175	93	60	46	106	374		3.0	1.4	13.5
6	1980	32	31	29	2	0	0	0	31	0.5	1.1	0.1	1.7
	2000		43	32	9	2	0	2	43		0.4	0.1	2.2
	2020		61	34	13	10	0	10	57		0.7	0.0	2.9
7	1980	38	28	28	0	0	0	0	28	0.4	1.1	0.1	1.6
	2000		43	38	1	0	4	4	43		0.6	0.0	2.2
	2020		67	42	6	0	19	19	67		1.0	0.1	3.3
8	1980	73	107	73	34	0	0	0	107	0.5	2.5[11]	3.0	6.0
	2000		187	73	114	0	0	0	187		0.0	3.6	9.6
	2020		310	73	159	36	42	78	310		0.0	5.7	15.3
9	1980	400	133	133	0	0	0	0	133	1.3	1.5[12]	4.7	7.5
	2000		204	204	0	0	0	0	204		0.0	3.1	10.6
	2020		309	309	0	0	0	0	309		0.0	4.5	15.1
10	1980	939	256	256	0	0	0	0	256	1.3	2.1[13]	11.0	14.4
	2000		442	442	0	0	0	0	442		0.0	8.6	23.0
	2020		737	737	0	0	0	0	737		0.0	13.3	36.3
LMR	1980	1,862	1,166	852	105	147	52	199	1,166	16.4	20.8	24.8	62.0
	2000		1,947	1,368	235	257	71	328	1,931		11.2	20.8	94.0
	2020		3,154	2,096	321	362	134	496	2,913		16.1	35.4	145.5

7/ Public owned lands developed and used for recreation in 1970.
8/ Incremental development of public owned lands at suitable locations.
9/ Incremental public acquisition and development of privately owned land suitable for recreation development and use.
10/ Cumulative recreation development by time frames. Lands are multiple-use for environmental quality.
11/ Develop 100 acres with existing access. Acquire access and develop 2,400 acres.
12/ Develop 200 acres with existing access. Acquire access and develop 1,300 acres.
13/ Develop 100 acres with existing access. Acquire access and develop 2,000 acres.

Table 99 - Recreation Plan, National Income Objective, Lower Mississippi Region (Cont'd)

		Land Areas											
		Class B Land (1,000 Acres)				Class C Land (1,000 Acres)				Total Recreation Land (1,000 Acres)			
			Proposed Development				Proposed Development				Proposed Development		
WRPA	Time Frame	Existing Development 7/	Access & Facilities 8/	Acquisition & Facilities 9/	Subtotal 10/	Existing Development 7/	Access Only 8/	Acquisition & Access 9/	Subtotal 10/	Existing Development 7/	Access & Facilities 8/	Acquisition, Access & Facilities 9/	WRPA Total 10/
2	1980	14.1	0.0	1.0	15.1	0.6	0.0	0.0	0.6	20.8	0.0	2.0	22.8
	2000		0.0	0.0	15.1		0.0	0.1	0.7		0.0	1.4	24.2
	2020		0.0	5.7	20.8		0.0	0.2	0.9		0.0	9.6	33.8
3	1980	4.7	16.3	1.8	22.8	0.2	1.0	0.0	1.2	7.8	24.9	5.1	37.8
	2000		15.9	1.8	40.5		0.7	0.0	1.9		23.4	4.7	65.9
	2020		7.8	18.9	67.2		1.1	0.0	3.0		19.8	23.5	109.2
4	1980	1.9	3.4	0.9	6.2	26.5	0.0	0.0	26.5	29.2	5.8	1.5	36.5
	2000		2.1	0.5	8.8		5.6	0.0	32.1		9.0	0.8	46.3
	2020		3.4	0.8	13.0		13.4	0.0	45.5		17.3	2.9	66.5
5	1980	4.5	5.4	0.6	10.5	23.8	0.0	0.0	23.8	30.9	7.9	1.6	40.4
	2000		4.5	0.5	15.5		7.7	0.0	31.5		14.3	1.4	56.1
	2020		6.6	1.0	23.1		15.4	0.0	46.9		25.0	2.4	83.5
6	1980	0.7	2.1	0.2	3.0	0.0	0.0	0.2	0.2	1.2	3.2	0.5	4.9
	2000		0.8	0.0	3.8		0.0	0.0	0.2		1.2	0.1	6.2
	2020		1.1	0.2	5.1		0.0	0.0	0.2		1.8	0.2	8.2
7	1980	0.7	1.8	0.2	2.7	0.1	0.0	0.0	0.1	1.2	2.9	0.3	4.4
	2000		1.1	0.1	3.9		0.1	0.0	0.2		1.8	0.1	6.3
	2020		1.6	0.2	5.7		0.1	0.0	0.3		2.7	0.3	9.3
8	1980	1.7	5.7	3.0	10.4	0.0	0.0	0.5	0.5	2.2	8.2	6.5	16.9
	2000		0.0	6.2	16.6		0.0	0.3	0.8		0.0	10.1	27.0
	2020		0.0	9.7	26.3		0.0	0.4	1.2		0.0	15.8	42.8
9	1980	1.9	10.8	0.2	12.9	0.2	0.4	0.0	0.6	3.4	12.7	4.9	21.0
	2000		0.0	5.4	18.3		0.3	0.0	0.9		0.3	8.5	29.8
	2020		0.0	7.7	26.0		0.2	0.0	1.1		0.2	12.2	42.2
10	1980	1.7	6.3	16.9	24.9	0.0	0.1	1.1	1.2	3.0	8.5	29.0	40.5
	2000		0.0	14.7	39.6		0.0	0.6	1.8		0.0	23.9	64.4
	2020		0.0	22.8	62.4		0.0	0.9	2.7		0.0	37.0	101.4
LMR	1980	31.9	51.8	24.8	108.5	51.4	1.5	1.8	54.7	99.7	74.1	51.4	226.2
	2000		24.4	29.2	162.1		14.5	1.0	70.1		50.0	51.0	326.2
	2020		20.5	67.0	249.6		30.2	1.5	101.8		66.8	103.9	496.9

7/ Public owned lands developed and used for recreation in 1970.
8/ Incremental development of public owned lands at suitable locations.
9/ Incremental public acquisition and development of privately owned land suitable for recreation development and use.
10/ Cumulative recreation development by time frames. Lands are multiple-use for environmental quality.

Table 100 -Effectiveness of Recreation Plan, National Income Objective, Lower Mississippi Region

Need Category	WRPA	Time Frame	Percent of Need Met
Land			
Class A	All	All	100
Class B	All	All	100
Class C	All	All	100
Water			
Large Lakes	All	1980	100
	2	2000	80
	3	2000	98
	4 - 10	2000	100
	2	2020	51
	3	2020	54
	4	2020	69
	5	2020	100
	6	2020	84
	7 - 10	2020	100
Small Lakes	All	All	100

Fish and Wildlife Plan

The Program A Fish and Wildlife Plan summarized in table 101 is aimed at satisfying as many as possible of the region's hunting and fishing needs. Plan measures include easements and fee purchase which will increase primary use wildlife lands more than 1.4 million acres over the next 50 years. Furthermore, the plan includes provisions to promote access to another 25 million acres of land and to nearly all of the region's 500,000 acres of water areas less than 2 acres in size (ponds) by way of a public education program. Measures are also included to insure diversion of 4,473 m.g.d. of the region's ground and surface waters for propagation of fish and wildlife. The plan for the coastal and estuarine area includes additional measures of benefit to fish and wildlife. That plan is directed at maintaining the productive capacity of the estuarine zone at the 1970 level of production and is discussed following plans for problem amelioration. Additional fish and wildlife enhancement measures are included in the agricultural sector. Production of catfish and crayfish as an adjunct to agriculture satisfies a small portion of the region's fishing need, but no assessment of needs satisfied by that private sector activity is made herein. If the Program A Fish and Wildlife Plan is realized in full, its effectiveness in meeting needs will be as shown on table 102.

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Table 101 - Fish and Wildlife Plan, National Income Objective, Lower Mississippi Region

WRPA	Time Frame	Lakes (1,000 Acres)1/ Available Resource2/	Lakes Incremental Use Intra-WRPA	Lakes Incremental Use Inter-WRPA Commuting	Lakes Cumulative Use	Ponds (1,000 Acres)1/ Available Resource2/	Ponds Incremental Use	Ponds Cumulative Use	Estuaries (1,000 Acres)1/ Available Resource2/	Estuaries Incremental Use Intra-WRPA	Estuaries Incremental Use Inter-WRPA Commuting	Estuaries Cumulative Use	Total Water Surface Area (1,000 Acres) Available Resource	Total Incremental Use Intra-WRPA	Total Incremental Use Inter-WRPA Commuting	Total Use
2	1980	189	36	0	36	52	26	26	0	0	25	25	241	62	25	87
	2000		4	0	40		3	29		0	2	27		7	2	96
	2020		8	0	48		5	34		0	5	32		13	5	114
3	1980	72	72	11	83	104	60	60	0	0	56	56	176	132	67	199
	2000		0	30	113		21	81		0	20	76		21	50	270
	2020		0	41	154		30	111		0	28	104		30	69	369
4	1980	207	37	0	37	54	27	27	0	0	25	25	361	64	25	89
	2000		4	0	41		3	30		0	3	28		7	3	99
	2020		9	0	50		6	36		0	5	33		15	5	119
5	1980	251	50	0	50	68	36	36	0	0	41	41	319	86	41	127
	2000		9	0	59		7	43		0	3	44		16	3	146
	2020		13	0	73		9	52		0	10	54		22	10	178
6	1980	72	10	0	10	16	8	8	0	0	9	9	88	18	9	27
	2000		1	0	11		0	8		0	0	9		1	0	28
	2020		1	0	12		0	8		0	0	9		1	0	29
7	1980	94	9	0	9	14	7	7	0	0	8	8	108	16	8	24
	2000		2	0	11		1	8		0	1	9		3	1	28
	2020		2	0	13		1	9		0	2	11		3	2	33
8	1980	118	36	0	36	46	26	26	0	0	158	158	164	62	158	220
	2000		10	0	46		7	33		0	44	202		17	44	281
	2020		14	0	60		10	43		0	61	263		24	61	366
9	1980	538	45	0	45	62	32	32	545	114	0	114	1,145	191	0	191
	2000		6	0	51		5	37		15	0	129		26	0	217
	2020		9	0	60		6	43		22	0	151		37	0	254
10	1980	1,158	86	0	86	108	62	62	2,736	503	0	503	4,002	651	0	651
	2000		24	0	110		18	80		140	0	643		182	0	833
	2020		33	0	143		23	103		191	0	834		247	0	1,080
LMR	1980	3,067	381	11	392	524	284	284	3,281	617	322	939	6,872	1,282	333	1,615
	2000		60	30	482		65	349		155	73	1,167		280	103	1,998
	2020		89	41	612		90	439		213	111	1,491		392	152	2,542

1/ No public investment involved.
2/ Based on 1970 conditions.

Table 101 - Fish and Wildlife Plan, National Income Objective, Lower Mississippi Region (Cont'd)

		Water Surface Areas		Land Areas												
		Cumulative Stream Access & Protection 5/ (miles)	Cumulative Water Withdrawals 6/ (mgd)	Primary Use Wildlife Lands (1,000 Acres) 3/				Secondary Use Wildlife Lands (1,000 Acres) 1/					Total Wildlife Lands (1,000 Acres)			
					Incremental Additions 4/		Cumulative	Open Land								
WRPA	Time Frame			Existing	Open Land	Forest	Subtotal	Cropland	Pasture	Wetlands	Forests	Subtotal	Open Land	Wetlands	Forests	Total
2	1980	1,203	630	280.5	3.5	100.5	384.5	288.0	119.5	101.0 7/	1325.0	1833.5	411.0	101.0	1706.0	2218.0
	2000	1,203	740		0	63.6	448.1	319.0	133.5	101.0 7/	930.4	1483.9	456.0	101.0	1375.0	1932.0
	2020	1,203	850		0	90.7	538.8	375.0	157.5	101.0 7/	656.7	1290.2	536.0	101.0	1192.0	1829.0
3	1980	822	76	186.3	15.4	41.8	243.5	652.0	263.6	64.0 7/	1827.9	2807.5	931.0	64.0	2056.0	3051.0
	2000	822	122		0	38.1	281.6	890.0	364.6	64.0 7/	1233.8	2552.4	1270.0	64.0	1500.0	2834.0
	2020	822	248		0	54.3	335.9	1214.0	504.6	64.0 7/	523.5	2306.1	1734.0	64.0	844.0	2642.0
4	1980	1,100	53	165.4	0	92.2	257.6	292.0	125.0	97.0 7/	1524.4	2038.4	417.0	97.0	1782.0	2296.0
	2000	1,100	83		0	43.0	300.6	327.0	140.0	97.0 7/	1046.4	1610.4	467.0	97.0	1547.0	1911.0
	2020	1,100	117		0	61.3	361.9	391.0	167.0	97.0 7/	884.1	1539.1	558.0	97.0	1246.0	1901.0
5	1980	1,931	285	258.4	0	103.5	361.9	394.0	169.0	531.0	6906.1	8000.1	563.0	531.0	7268.0	8362.0
	2000	1,931	345		0	60.4	422.3	467.0	200.0	723.0	9132.7	10,522.7	667.0	723.0	9555.0	10,945.0
	2020	1,931	407		0	86.2	508.5	572.0	245.0	791.0	8514.5	10,122.5	817.0	791.0	9023.0	10,631.0
6	1980	536	75	45.2	0	25.0	70.2	83.0	35.0	85.0	580.8	783.8	118.0	85.0	651.0	854.0
	2000	536	91		0	11.7	81.9	83.0	36.0	85.0	567.1	771.1	119.0	85.0	649.0	853.0
	2020	536	108		0	16.7	98.6	91.0	39.0	85.0	539.4	754.4	130.0	85.0	638.0	853.0
7	1980	450	7	74.0	0	30.0	104.0	74.0	32.0	49.0	2235.0	2390.0	106.0	49.0	2339.0	2494.0
	2000	450	13		0	17.4	121.4	85.0	36.0	49.0 7/	1255.6	1425.6	121.0	49.0	1377.0	1547.0
	2020	450	18		0	24.7	146.1	103.0	44.0	49.0 7/	743.9	939.9	147.0	49.0	890.0	1086.0
8	1980	400	5	5.0	0	14.0	19.0	217.0 7/	122.0	144.0	2080.0	2563.0	339.0	144.0	2099.0	2582.0
	2000	400	8		0	3.2	22.2	170.0 7/	156.0	190.0	2012.8	2528.8	326.0	190.0	2035.0	2551.0
	2020	400	12		0	4.5	26.7	193.0 7/	262.0	395.0	1839.3	2689.3	455.0	395.0	1866.0	2716.0
9	1980	928	557	690.2	0	27.0	717.2	829.0	153.0	144.0	1214.8	2340.8	982.0	144.0	1952.0	3058.0
	2000	928	745		0	119.7	836.9	1216.0	172.0	162.0	942.1	2492.1	1388.0	162.0	1779.0	3329.0
	2020	928	865		0	170.8	1007.7	1636.0	202.0	190.0	569.3	2597.3	1838.0	190.0	1577.0	3605.0
10	1980	329	1,845	185.3	0	11.0	196.3	271.0 7/	291.0	275.0	1005.7	1842.7	562.0	275.0	1202.0	2039.0
	2000	329	1,847		0	32.8	229.1	250.0 7/	372.0 7/	353.0	912.9	1887.9	622.0	353.0	1142.0	2117.0
	2020	329	1,848		0	46.7	275.8	242.0 7/	424.0 7/	530.0	765.2	1961.2	666.0	530.0	1041.0	2237.0
LMR	1980	7,699	3,533	2021.4 8/	18.9	445.0	2485.2	3100.0	1310.1	1467.0	19,447.7 8/	25,324.8	4429.0	1467.0	21,914.0	27,810.0
	2000	7,699	4,034		0	389.9	2875.1	3807.0	1610.1	1801.0	18,781.8 8/	25,999.9	5436.0	1801.0	21,638.0	28,875.0
	2020	7,699	4,473		0	561.9	3437.0	4817.0	2045.1	2279.0	15,777.9 8/	24,919.0	6881.0	2279.0	19,196.0	28,356.0

3/ Composed primarily of wildlife management areas. Existing areas are heavily wooded and counted entirely as forest land.
4/ Public acquisition through easement or fee title.
5/ Public investment based on provision of one access point for every 10 miles of stream.
6/ Withdrawals to maintain water levels in management areas for mast producing green tree reservoirs and duck resting areas, and to replenish lakes for sport fishing. Costs of pumping and diversion facilities included in public investment costs for Program A.
7/ Limited resource capability requires inter-WRPA commuting for needs satisfaction.
8/ Includes forest land in WRPA 1.

The effectiveness of the fish and wildlife plan relative to providing for forest habitat and stream fisheries habitat is more a function of resource capability than a function of the proposed measures. Because of this, the indicated degree of effectiveness or ineffectiveness of the plan is governed by the imbalance between resource needs and resource availability.

Table 102- Effectiveness of Fish and Wildlife Plan, National Income Objective, Lower Mississippi Region

Need Category	WRPA	Time Frame	Percent of Need Met
Land			
Open Land	All 1/	All	100
Wetlands	All 1/	All	100
Forest land	All	1980	100
	2	2000-2020	61-45
	3	2000-2020	24-10
	4	2000-2020	58-45
	5	2000-2020	100
	6	2000-2020	100-99
	7	2000-2020	100
	8	2000-2020	79-56
	9	2000-2020	63-48
	10	2000-2020	19-13
Water Surface Area			
Lakes	All 1/	All	100
Ponds	All	All	100
Estuaries	All 1/	All	100
Streams	2	1980-2020	100-87
	3	1980-2020	34-18
	4	1980-2020	100-76
	5	1980-2020	100-92
	6	1980-2020	100
	7	1980-2020	100
	8	1980-2020	38-23
	9	1980-2020	71-54
	10	1980-2020	13-8
Water Withdrawals	All	All	100

1/ Inter-WRPA commuting required for needs satisfaction.

Environmental Quality Plan

The National Income plan for environmental quality centers around land and water areas whose aesthetic qualities or other attributes make them worthy of preservation for the enjoyment of future generations. Specific areas that fall within this category include the 35,000 acres of land and water areas listed in table 103. These areas can be reserved for primary use for environmental quality purposes without materially detracting from the satisfaction of high priority needs for food and fiber production. Thus they have been included as components of the National Income Program. In addition, the National Income Program includes positive measures to protect scenic rivers and lakes and to provide for needed open and green space in urban areas. The plan is summarized in table 104. Its effectiveness, in terms of the percentage of total environmental quality needs satisfied is given in table 105.

Table 103 - Lands Designated for Primary Use as Environmental Quality Components, National Income Program, Lower Mississippi Region

WRPA	Feature	Land Area	Existing Use	Environmental Quality Attribute(s)
1	None	-	-	-
2	Grand Prairie	1,000	Pasture	Ecological System
	Dismal Swamp	2,000	Forest	Ecological System
	Dark Cypress Swamp	2,000	Forest 1/	Ecological System
	Arnet Shutin	1,000	Forest 1/	Ecological System
	Mill Stream Shutin	1,000	Forest 1/	Ecological System
3	Reelfoot Lake	400	Fish and Wildlife	Scenic natural lake with unique ecological and geological features
	Murphys Pond	100	Fish and Wildlife	Scenic lake, unique ecological area
	Open Lake	500	Fish and Wildlife	Scenic lake, unique ecological area
4	Ashland Brake	1,000	Forest 1/	Ecological System
	Beckham Brake	1,000	Forest 1/	Ecological System
	Gayden Brake	1,100	Forest 1/	Ecological System
	Eagle Brake	900	Forest 1/	Ecological System
5	Seven Devils Swamp	5,000	Forest 1/	Ecological System, Wilderness Area

Table 103 - Lands Designated for Primary Use as Environmental Quality Components, National Income Program, Lower Mississippi Region (Cont'd)

WRPA	Feature	Land Area	Existing Primary Use	Environmental Quality Attribute(s)
6	None	-	-	-
7	Foster Lake area on Buffalo River	5,000	Forest1/	Wilderness Area
	Grand Gulf area	5,000	Forest1/	Wilderness Area
8	Port Hudson	100	"other"	Botanical System
	Chipola	50	Forest2/	Botanical System
	Clio	500	Forest3/	Botanical System
	Spruce Pine Stands in Livingston and Tangipahoa Parishes	1,000	Forest	Botanical System
	Pine Stand in St. Helena Parish	50	Forest4/	Botanical System
9	Atchafalaya Floodway	5,000	Forest1/	Wilderness Area and Wetlands
10	Avondale	200	Forest1/	Botanical System
	Spruce Pine Stand in St. Tammany Parish	800	Forest1/	Botanical System
Total land		34,700		

1/ Bottomland hardwood forest.
2/ Pines.
3/ Virgin cypress.
4/ Old very large loblolly pine stand with typical pine climax understory.

Problem Amelioration

Flood Control

The National Income Program flood control plan contains three basic components: (1) completion of the present backlog of works already under construction, including the immediate raising and strengthening of the Mississippi River Levees System and the expeditious completion

Table 104 - Environmental Quality Plan, National Income Objective, Lower Mississippi Region

Water Resources Planning Area and Resource Feature	Resource Use (1,000 Acres) 1980 Primary Use Established	1980 Primary Use New	1980 Secondary Use	1980 Total Use	2000 Primary Use	2000 Secondary Use	2000 Total Use	2020 Primary Use	2020 Secondary Use	2020 Total Use
WRPA 1										
Land										
Bottomland Hardwood Forest	-	-	873.0	873.0	-	873.0	873.0	-	873.0	873.0
Lake Shorelines	-	6.0[1/]	-	6.0	6.0	-	6.0	6.0	-	6.0
Total Land	-	6.0	873.0	879.0	6.0	873.0	879.0	6.0	873.0	879.0
Water Surface Area										
Lakes	36.0	4.0	-	40.0	40.0	-	40.0	40.0	-	40.0
Scenic Rivers	-	-	-	-	-	-	-	-	-	-
Total Water Surface	36.0	-	40.0	40.0	-	40.0	40.0	-	40.0	40.0
WRPA 2										
Land										
Bottomland Hardwood Forests	-	-	507.0	507.0	-	347.0	347.0	-	261.0	261.0
Ecological Systems	-	7.0[1/]	114.0	121.0	7.0	114.0	121.0	7.0	114.0	121.0
Geological Systems	-	-	507.0	507.0	-	507.0	507.0	-	507.0	507.0
Lake Shorelines	-	1.0[1/]	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space(Urban)	-	1.0[2/]	7.0	8.0	0.0[3/]	8.0	8.0	0.0[3/]	8.0	8.0
Scenic River Banks	-	18.0[1/]	-	18.0	18.0	-	18.0	18.0	-	18.0
Wilderness Areas	-	-	44.0	44.0	-	44.0	44.0	-	44.0	44.0
Total Land	-	27.0	1,179.0	1,206.0	26.0	1,020.0	1,046.0	26.0	934.0	960.0
Water Surface Area										
Lakes	5.0	11.0	-	16.0	16.0	-	16.0	16.0	-	16.0
Scenic Rivers	-	4.0	-	4.0	4.0	-	4.0	4.0	-	4.0
Total Water Surface	5.0	15.0	-	20.0	20.0	-	20.0	20.0	-	20.0
WRPA 3										
Land										
Bottomland Hardwood Forests	-	-	607.0	607.0	-	410.0	410.0	-	351.0	351.0
Lake Shorelines	-	1.0[1/]	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space(Urban)	-	31.0[2/]	3.0	34.0	10.5[3/]	23.5	34.0	[3/]	34.0	34.0
Scenic River Banks	3.0	25.0[1/]	-	28.0	25.0	3.0	25.0	25.0	3.0	28.0
Wetlands	-	-	64.0	64.0	-	64.0	64.0	-	64.0	64.0
Total Land	3.0	57.0	674.0	734.0	36.5	500.5	534.0	26.0	452.0	478.0
Water Surface Area										
Lakes	33.0	1.0	-	34.0	34.0	-	34.0	34.0	-	34.0
Scenic Rivers	1.0	6.0	-	7.0	7.0	-	7.0	7.0	-	7.0
Total Water Surface	34.0	7.0	-	41.0	41.0	-	41.0	41.0	-	41.0
WRPA 4										
Land										
Bottomland Hardwood Forests	-	-	930.0	930.0	-	930.0	930.0	-	930.0	930.0
Ecological Systems	-	4.0[1/]	6.0	10.0	4.0	6.0	10.0	4.0	6.0	10.0
Geological Systems	-	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0
Lake Storelines	-	2.0[1/]	-	2.0	2.0	-	2.0	2.0	-	2.0
Open and Green Space(Urban)	-	8.0[2/]	-	8.0	2.6[3/]	5.4	8.0	[3/]	8.0	8.0
Wilderness Areas	-	-	5.0	5.0	-	5.0	5.0	-	5.0	5.0
Total Land	-	14.0	942.0	956.0	8.6	947.4	956.0	6.0	950.0	956.0
Water Surface Area										
Lakes	17.0	3.0	-	20.0	20.0	-	20.0	20.0	-	20.0
Scenic Rivers	-	-	-	-	-	-	-	-	-	-
	17.0	3.0	-	20.0	20.0	-	20.0	20.0	-	20.0

Table 104 - Environmental Quality Plan, National Income Objective, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Resource Feature	Resource Use (1,000 Acres) 1980 Primary Use Established	1980 Primary Use New	1980 Secondary Use	1980 Total Use	2000 Primary Use	2000 Secondary Use	2000 Total Use	2020 Primary Use	2020 Secondary Use	2020 Total Use
WRPA 5										
Land										
Bottomland Hardwood Forests	-	-	2,392.0	2,392.0	-	2,323.0	2,323.0	-	2,190.0	2,190.0
Ecological Systems	-	-	20.0	20.0	-	20.0	20.0	-	20.0	20.0
Geological Systems	-	-	22.0	22.0	-	22.0	22.0	-	22.0	22.0
Lake Shorelines	-	1.0 [1]	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	13.0 [2]	-	13.0	3.9 [3]	9.1	13.0	[3]	13.0	13.0
Scenic River Banks	14.0	14.0 [1]	-	28.0	28.0	-	28.0	28.0	-	28.0
Wilderness Areas	-	5.0 [1]	20.0	25.0	5.0	20.0	25.0	5.0	20.0	25.0
Total Land	14.0	33.0	2,454.0	2,501.0	37.9	2,394.1	2,432.0	34.0	2,265.0	2,299.0
Water Surface Area										
Lakes	33.0	1.0	-	34.0	34.0	-	34.0	34.0	-	34.0
Scenic Rivers	4.0	3.0	-	7.0	7.0	-	7.0	7.0	-	7.0
Total Water Surface	37.0	4.0	-	41.0	41.0	-	41.0	41.0	-	41.0
WRPA 6										
Land										
Bottomland Hardwood Forests	-	-	608.0	608.0	-	608.0	608.0	-	608.0	608.0
Lake Shorelines	-	1.0 [1]	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	2.0 [2]	-	2.0	[3]	2.0	2.0	[3]	2.0	2.0
Total Land	-	3.0	608.0	611.0	1.0	610.0	611.0	1.0	610.0	611.0
Water Surface Area										
Lakes	8.0	1.0	-	9.0	9.0	-	9.0	9.0	-	9.0
Scenic Rivers	-	-	-	-	-	-	-	-	-	-
Total Water Surface	8.0	1.0	-	9.0	9.0	-	9.0	9.0	-	9.0
WRPA 7										
Land										
Bottomland Hardwood Forest	-	-	425.0	425.0	-	369.0	369.0	-	369.0	369.0
Ecological Systems	-	-	3.0	3.0	-	3.0	3.0	-	3.0	3.0
Geological Systems	-	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0
Lake Shorelines	-	1.0 [1]	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	1.0 [2]	-	1.0	[3]	1.0	1.0	[3]	1.0	1.0
Scenic River Banks	-	13.0 [1]	-	13.0	13.0	-	13.0	13.0	-	13.0
Wilderness Areas	-	10.0 [1]	20.0	30.0	10.0	20.0	30.0	10.0	20.0	30.0
Total Land	-	25.0	449.0	474.0	24.0	394.0	418.0	24.0	394.0	418.0
Water Surface Area										
Lakes	7.0	1.0	-	8.0	8.0	-	8.0	8.0	-	8.0
Scenic Rivers	-	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0
Total Water Surface	7.0	4.0	-	11.0	11.0	-	11.0	11.0	-	11.0
WRPA 8										
Land										
Botanical Systems	-	1.7 [1]	0.3	2.0	1.7	0.3	2.0	1.7	0.3	2.0
Bottomland Hardwood Forests	-	-	896.0	896.0	-	868.0	868.0	-	794.0	794.0
Geological Systems	-	-	203.0	203.0	-	203.0	203.0	-	203.0	203.0
Lake Shorelines	-	1.0 [1]	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	11.0 [2]	1.0	12.0	2.4 [3]	9.6	12.0	[3]	12.0	12.0
Scenic River Banks	8.0	9.0 [1]	-	17.0	17.0	-	17.0	17.0	-	17.0
Total Land	8.0	22.7	1,100.3	1,131.0	22.1	1,080.9	1,103.0	19.7	1,009.3	1,029.0
Water Surface Area										
Lakes	61.0	-	-	61.0	61.0	-	61.0	61.0	-	61.0
Scenic Rivers	2.0	2.0	-	4.0	4.0	-	4.0	4.0	-	4.0
Total Water Surface	63.0	2.0	-	65.0	65.0	-	65.0	65.0	-	65.0

Table 104 - Environmental Quality Plan, National Income Objective, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Resource Feature	Resource Use (1,000 Acres) 1980 Primary Use Established	1980 Primary Use New	1980 Secondary Use	1980 Total Use	2000 Primary Use	2000 Secondary Use	2000 Total Use	2020 Primary Use	2020 Secondary Use	2020 Total Use
WRPA 9										
Land										
Beaches and Shores	6.0	-	10.0	16.0	6.0	10.0	16.0	6.0	10.0	16.0
Botanical Systems	533.0	-	257.0	790.0	533.0	257.0	790.0	533.0	257.0	790.0
Bottomland Hardwood Forests	-	-	99.0	99.0	-	99.0	99.0	-	99.0	99.0
Geological Systems	-	-	6.0	6.0	-	6.0	6.0	-	6.0	6.0
Lake Shorelines	-	3.0 1/	-	3.0	3.0	-	3.0	3.0	-	3.0
Open and Green Space (Urban)	-	11.0 2/	1.0	12.0	3/	12.0	12.0	3/	12.0	12.0
Scenic River Banks	6.0	3.0 1/	-	9.0	9.0	-	9.0	9.0	-	9.0
Wetlands	67.0	-	54.0	121.0	67.0	54.0	121.0	67.0	54.0	121.0
Wilderness Areas	-	5.0 1/	550.0	555.0	5.0	550.0	555.0	5.0	550.0	555.0
Total Land	612.0	22.0	977.0	1,611.0	623.0	988.0	1,611.0	623.0	988.0	1,611.0
Water Surface Area										
Lakes	110.0	-	-	110.0	110.0	-	110.0	110.0	-	110.0
Scenic Rivers	1.0	1.0	-	2.0	2.0	-	2.0	2.0	-	2.0
Total Water Surface	111.0	1.0	-	112.0	112.0	-	112.0	112.0	-	112.0
WRPA 10										
Land										
Beaches and Shores	41.0	-	119.0	160.0	41.0	119.0	160.0	41.0	119.0	160.0
Botanical Systems	-	1.0 1/	-	1.0	1.0	-	1.0	1.0	-	1.0
Bottomland Hardwood Forests	-	-	877.0	877.0	-	833.0	833.0	-	772.0	772.0
Lake Shorelines	-	4.0 1/	-	4.0	4.0	-	4.0	4.0	-	4.0
Open and Green Space (Urban)	-	30.0 2/	1.0	31.0	8.0 3/	23.0	31.0	3/	31.0	31.0
Scenic River Banks	4.0	-	-	4.0	4.0	-	4.0	4.0	-	4.0
Total Land	45.0	35.0	997.0	1,077.0	58.0	975.0	1,033.0	50.0	922.0	972.0
Water Surface Area										
Lakes	124.0	-	-	124.0	124.0	-	124.0	124.0	-	124.0
Scenic Rivers	1.0	-	-	1.0	1.0	-	1.0	1.0	-	1.0
Total Water Surface	125.0	-	-	125.0	125.0	-	125.0	125.0	-	125.0
WRPA'S 1 through 10										
Land										
Beaches and shores	47.0	-	129.0	176.0	47.0	129.0	176.0	47.0	129.0	176.0
Botanical Systems	533.0	2.7	258.3	794.0	535.7	258.3	794.0	535.7	258.3	794.0
Bottomland Hardwood Forest	-	-	8,214.0	8,214.0	-	7,660.0	7,660.0	-	7,247.0	7,247.0
Ecological Systems	-	11.0	143.0	154.0	11.0	143.0	154.0	11.0	143.0	154.0
Geological Systems	-	-	740.0	740.0	-	740.0	740.0	-	740.0	740.0
Lake Shorelines	-	21.0	-	21.0	21.0	-	21.0	21.0	-	21.0
Open and Green Space (Urban)	-	108.0	13.0	121.0	27.4 3/	93.6	121.0	3/	121.0	121.0
Scenic River Banks	35.0	82.0	-	117.0	117.0	-	117.0	117.0	-	117.0
Wetlands	67.0	-	118.0	185.0	67.0	118.0	185.0	67.0	118.0	185.0
Wilderness Areas	-	20.0	639.0	659.0	20.0	639.0	659.0	20.0	639.0	659.0
Total Land	682.0	244.7	10,254.3	11,181.0	846.1	9,780.9	10,627.0	818.7	9,395.3	10,214.0
Water Surface Area										
Lakes	384.0	22.0	-	406.0	406.0	-	406.0	406.0	-	406.0
Scenic Rivers	9.0	19.0	-	28.0	28.0	-	28.0	28.0	-	28.0
Total Water Surface	393.0	41.0	-	434.0	434.0	-	434.0	434.0	-	434.0

1/ Public investment required between 1970 and 1980; operation and maintenance required thereafter.
2/ Land multi-use for environmental quality purposes and Class A recreation purposes. Public investment allocated to both purposes.
3/ Primary use shifts with the development of open and green space for recreation purposes.

Table 105 - Effectiveness of Environmental Quality Plan, National Income Objective, Lower Mississippi Region

WRPA/Time Frame		Percent of Needs Met: Land										Water Surface	
		Beaches and Shores	Botanical Systems	Bottomland Hardwood Forests	Ecological Systems	Geological Systems	Lake Shorelines	Open and Green Space1/	Scenic River Banks	Wetlands	Wilderness Areas	Lakes	Scenic Rivers
1	1980	-	-	0	-	-	100	-	-	-	-	100	-
	2000	-	-	0	-	-	100	-	-	-	-	100	-
	2020	-	-	0	-	-	100	-	-	-	-	100	-
2	1980	-	-	12	11	31	100	100	100	-	20	100	100
	2000	-	-	12	11	31	100	100	100	-	20	100	100
	2020	-	-	12	11	31	100	100	100	-	20	100	100
3	1980	-	-	16	-	-	100	100	100	17	-	100	100
	2000	-	-	16	-	-	100	100	100	17	-	100	100
	2020	-	-	16	-	-	100	100	100	17	-	100	100
4	1980	-	-	82	40	0	100	100	100	-	0	100	100
	2000	-	-	82	40	0	100	100	100	-	0	100	100
	2020	-	-	82	40	0	100	100	100	-	0	100	100
5	1980	-	-	82	75	0	100	100	100	-	33	100	100
	2000	-	-	82	75	0	100	100	100	-	33	100	100
	2020	-	-	82	75	0	100	100	100	-	33	100	100
6	1980	-	-	81	-	-	100	100	100	-	-	100	100
	2000	-	-	81	-	-	100	100	100	-	-	100	100
	2020	-	-	81	-	-	100	100	100	-	-	100	100
7	1980	-	-	81	0	0	100	100	100	-	33	100	100
	2000	-	-	81	0	0	100	100	100	-	33	100	100
	2020	-	-	81	0	0	100	100	100	-	33	100	100
8	1980	-	85	81	-	0	100	100	100	-	-	100	100
	2000	-	85	81	-	0	100	100	100	-	-	100	100
	2020	-	85	81	-	0	100	100	100	-	-	100	100
9	1980	38	67	82	-	0	100	100	100	55	1	100	100
	2000	38	67	82	-	0	100	100	100	55	1	100	100
	2020	38	67	82	-	0	100	100	100	55	1	100	100
10	1980	26	100	80	-	-	100	100	100	-	-	100	100
	2000	26	100	80	-	-	100	100	100	-	-	100	100
	2020	26	100	80	-	-	100	100	100	-	-	100	100

1/ Urban Only

of the channel improvement feature of the MR&T Project, and accelerated completion of other works including hurricane protection works in the coastal area and the existing backlog of upstream watershed projects; (2) construction of authorized and proposed new works within the time frames identified on table 106; and (3) expansion of governmental flood plain information activities and development and implementation of appropriate local controls to govern the growth of damageable property in flood plains.

Completion of Project Backlog. Completion of the present backlog of flood control works now under construction in the Lower Mississippi Region is the most pressing water resources task facing the region. These projects must be completed in order to get to the conditions variously described herein as "existing projects," "remaining flood problems," or "present status." Though many of the main stem Mississippi River flood control works are in place, much work remains to be done on both the levee system and the channel improvement features of the MR&T Project. It was determined, based on the data available from major discharges and high stages of the 1973 flood that a total of more than 800 miles of levees along the Mississippi River, in tributary areas, and in the Atchafalaya Floodway will have to be built from 1 to 6 feet higher than originally planned to protect the Valley from the project design flood. This is due to a loss in channel capacity because of the dynamic nature of the River, its persistent tendency to meander, instabilities introduced by the earlier cutoff program, and incomplete bank stabilization works, and other hydraulic phenomena. All mainline Mississippi River and Atchafalaya Floodway levees should be constructed to full grade and section as soon as possible. The levees protect millions of people, hundreds of towns and cities, and billions of dollars worth of developments. Any failure of the system would be catastrophic and a major failure would result in a disaster of staggering proportions. The valley, with its contents, must be made safe from the largest reasonable flood which might occur on the Mississippi River. Were such a flood to occur now, as it very nearly did in 1927, 1937, 1950, and 1973, the presently constructed system would suffer a major failure, the results of which the region and the Nation can ill afford. The National Income Program flood control plan includes components allowing for the timely completion of all remaining work on the MR&T Project by the year 1985. The plan calls for completion of the Mississippi River levee system in 5 years because of its criticality.

The major hurricane protection projects in the coastal area must also be brought to an expeditious completion. These projects will provide protection from tidal flooding and hurricane storm waters to the densely populated and intensely developed centers in the region's coastal area. The disastrous hurricanes, Betsy in 1965 and Camille in 1969, caused well in excess of $100 million in damages to areas which will be protected upon completion of the hurricane protection projects. The potential for hurricane induced damage in the region is far greater

Table 106-Flood Control Plan, Structural Measures, Program A, Lower Mississippi Region

		Principal Streams											
		Reservoirs - Flood Control Storage (Acre-Feet)						Channel Improvement (Miles)			Levees (Miles)		
		Authorized		Proposed		Total							
WRPA	Time Frame	Number	Storage	Number	Storage	Number	Storage	Authorized	Proposed	Total	Authorized	Proposed	Total
1	1980	0	0	0	0	0	0	[1]	0	[1]	[2]	0	[2]
	2000	0	0	0	0	0	0		0			0	
	2020	0	0	0	0	0	0		0			0	
	TOTAL	0	0	0	0	0	0		0			0	
2	1980	0	0	0	0	0	0	604.1	37.5	641.6	0	5.9	5.9
	2000	0	0	0	0	0	0	497.6	120.4	618.0	9.7	0	9.7
	2020	0	0	0	0	0	0	122.0	218.0	340.0	0	0	0
	TOTAL	0	0	0	0	0	0	1,223.7	375.9	1,599.6	9.7	5.9	15.6
3	1980	0	0	1	18,000	1	18,000	215.3	76.7	292.0	7.7	0	7.7
	2000	0	0	0	0	0	0	0	51.7	51.7	0	169.2	169.2
	2020	0	0	0	0	0	0	0	96.9	96.9	0	0	0
	TOTAL	0	0	1	18,000	1	18,000	215.3	225.3	440.6	7.7	169.2	176.9
4	1980	0	0	0	0	0		338.3	590.0	928.3	356.4	3.0	359.4
	2000	0	0	0	0	0		45.4	162.7	208.1	14.3	62.3	76.6
	2020	0	0	0	0	0		0	605.0	605.0	0	82.5	82.5
	TOTAL	0	0	0	0	0		383.7	1,357.7	1,741.4	370.7	147.8	518.5
5	1980	10	239,000	1	211,000	11	450,000	66.0	3.0	69.0	83.0	69.9	152.9
	2000	0	0	1	80,000	1	80,000	0	242.9	242.9	59.0	129.7	188.7
	2020	0	0	0	0	0	0	0	62.0	62.0	0	2.0	2.0
	TOTAL	10	239,000	2	291,000	12	530,000	66.0	307.9	373.9	142.0	201.6	343.6
6	1980	0	0	0	0	0	0	266.7	0	266.7	0	0	0
	2000	0	0	0	0	0	0	0	159.6	159.6	0	1.5	1.5
	2020	0	0	0	0	0	0	0	105.0	105.0	0	0	0
	TOTAL	0	0	0	0	0	0	266.7	264.6	531.3	0	1.5	1.5
7	1980	0	0	0	0	0	0	0	12.0	12.0	0	12.4	12.4
	2000	0	0	0	0	0	0	0	0	0	0	7.0	7.0
	2020	0	0	0	0	0	0	0	0	0	0	6.0	6.0
	TOTAL	0	0	0	0	0	0	0	12.0	12.0	0	25.4	25.4
8	1980	0	0	0	0	0	0	0	6.0	6.0	0	0	0
	2000	0	0	0	0	0	0	0	3.0	3.0	0	0	0
	2020	0	0	0	0	0	0	0	3.0	3.0	0	10.5	10.5
	TOTAL	0	0	0	0	0	0	0	12.0	12.0	0	10.5	10.5
9	1980	0	0	0	0	0	0	83.0	80.0	163.0	0	13.5	13.5
	2000	0	0	0	0	0	0	0	0	0	0	13.9	13.9
	2020	0	0	0	0	0	0	0	0	0	0	62.0	62.0
	TOTAL	0	0	0	0	0	0	83.0	80.0	163.0	0	89.4	89.4
10	1980	0	0	0	0	0	0	0	0	0	0	20.0[3]	20.0[3]
	2000	0	0	0	0	0	0	0	0	0	0	61.6	61.6
	2020	0	0	0	0	0	0	0	0	0	0	44.0	44.0
	TOTAL	0	0	0	0	0	0	0	0	0	0	125.6	125.6
LMR	1980	10	239,000	2	229,000	12	468,000	1,573.4	805.2	2,378.6	447.1	124.7	571.8
	2000	0	0	1	80,000	1	80,000	543.0	740.3	1,283.3	83.0	445.2	528.2
	2020	0	0	0	0	0	0	122.0	1,089.9	1,211.9	0.0	207.0	207.0
	TOTAL	10	239,000	3	309,000	13	548,000	2,238.4	2,635.4	4,873.8	530.1	776.9	1,307.0

1/ Continuing long-term construction, Main stem-Mississippi River, underway.
2/ Eight hundred miles of levee to be raised to grade and section; 28.3 miles yet to be constructed in Mississippi River Levee and Floodway System.
3/ In addition, 7.6 miles of vegetated sand-dune and 1/2 mile jetty proposed for vicinity of Grand Isle hurricane protection.

Table 106 - Flood Control Plan, Structural Measures, Program A, Lower Mississippi Region (Cont'd)

WRPA	Time Frame	Principal Streams: Pumping Stations: Authorized	Pumping Stations: Proposed	Pumping Stations: Total	Other [5]: Locks Proposed	Other [5]: Diversion Structures Authorized	Other [5]: Low Flow Structures Authorized	Upstream Watersheds [4]: Floodwater Retarding Structures Proposed: Number	Floodwater Retarding Structures Proposed: Storage	Channel Improvements (Miles) Proposed	Other Proposed
1	1980	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0
2	1980	2	3	5	0	0	0	268	148,612	4,878	[6]
	2000	0	3	3	0	0	0	0	0	130	[6]
	2020	0	0	0	0	0	0	5	11,241	95	[6]
	TOTAL	2	6	8	0	0	0	273	159,853	5,103	[6]
3	1980	6	1	7	0	0	0	201	244,400	660	[6]
	2000	0	2	2	0	0	0	120	133,916	454	[6]
	2020	0	0	0	0	0	0	92	99,070	269	[6]
	TOTAL	6	3	9	0	0	0	413	477,386	1,383	[6]
4	1980	0	1	1	0	0	0	53	41,594	3,674	0
	2000	0	9	9	0	0	0	16	18,146	18	0
	2020	0	9	9	0	0	0	12	10,866	1,146	0
	TOTAL	0	19	19	0	0	0	81	70,606	4,838	0
5	1980	1	2	3	0	0	0	116	209,219	389	[6]
	2000	0	6	6	0	0	0	2	15,400	146	[6]
	2020	0	1	1	0	0	0	50	101,037	301	0
	TOTAL	1	9	10	0	0	0	168	325,656	836	[6]
6	1980	1	0	1	0	0	0	0	0	2,026	[6]
	2000	0	1	1	0	0	0	0	0	325	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	1	1	2	0	0	0	0	0	2,351	[6]
7	1980	0	1	1	0	0	0	284	423,335	1,157	0
	2000	0	2	2	0	0	0	94	141,543	163	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	3	3	0	0	0	378	564,878	1,320	0
8	1980	0	0	0	0	0	0	55	104,224	983	1 Pumping Plant
	2000	0	0	0	0	0	0	98	169,374	368	0
	2020	0	2	2	0	0	0	12	36,753	0	0
	TOTAL	0	2	2	0	0	0	165	310,351	1,351	1 Pumping Plant
9	1980	0	0	0	0	1	1	0	0	2,875	6 Water Contr Str
	2000	0	0	0	2	0	0	0	0	511	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	2	1	1	0	0	3,386	6 Water Contr Str
10	1980	0	5	5	0	0	0	0	0	505	100 Wtr Cntrl Str
	2000	0	17	17	5	0	0	3	13,111	344	50 Miles of Levee
	2020	0	3	3	0	0	0	0	0	40	
	TOTAL	0	25	25	5	0	0	3	13,111	889	Above
LMR	1980	11	11	22	0	1	1	977	1,171,384	17,147	
	2000	1	39	40	7	0	0	333	491,490	2,459	(Above)
	2020	0	15	15	0	0	0	171	258,967	1,851	
	TOTAL	12	65	77	7	1	1	1,481	1,921,841	21,457	

4/ Authorized projects in upstream watersheds are counted as "existing" projects and are not shown here.
5/ Primarily for hurricane protection. Other hurricane protection measures included in levees, channels, and pump plants.
6/ Unspecified number of water control structures.

than anything experienced in the past because of increased industrial and municipal growth in hurricane-prone areas. If the hurricane protection projects are not brought to a timely conclusion, there is a reasonable probability that the worst is yet to come.

Numerous smaller local protection projects in the region must also be brought to a speedy completion. Many of these projects will provide protection from urban flooding to small cities and towns.

In addition, some 60 small watershed projects must be expeditiously completed. These projects will lessen flood damages in upstream areas and, like many other flood control improvements, are designed to be multi-use with other types of output contributing to a general betterment of the regional welfare and economic enhancement.

Authorized and Proposed New Works. Completion of the backlog of projects in the Lower Mississippi Region will by no means solve the flood problems of the region. The rapid completion of those projects is necessary just to bring the level of damages down to those identified in Present Status and Future Needs and as described in more detail in Appendix E, Flood Problems.

The region is still faced with the problem of over $212 million in average annual flood damages. This damage potential, about equally divided between principal streams and upstream watersheds, will continue to grow until by the year 2020 an average annual flood damage level of roughly $490 million is expected. Half of that damage can and should be alleviated by economically feasible and workable structural solutions. In fact, much of the work required is presently authorized as shown on table 106. This authorized work is a compilation of projects which have not been funded for construction, and projects with lengthy construction schedules which, though technically classed as "under construction," actually will not be in place and providing the designed protection for 10 years or more, depending on future rates of funding. These projects include the St. Francis Basin Project, the Yazoo Basin Project, the Larto Lake to Jonesville Projects, the Cache River-Bayou DeView Project, the West Tennessee Tributaries Project, the West Kentucky Tributaries Project, and others. The authorized, unconstructed works in the Lower Mississippi Region consist of 10 reservoirs with a total flood control storage of 239,000 acre-feet, 2,238 miles of channel, improvement, 530 miles of levees, and 10 major pumping stations all associated with principal streams. Most of the work should be funded and constructed at a rate commensurate with completion by 1980 as shown in table 106. The remainder of the authorized work should be completed by 1985, except for the 122 miles of channel improvement (L'Anguille River, WRPA 2) shown in the 2020 time frame. Of the authorized works 530.1 miles of levees, 2,172 miles of channel improvement, and seven pumping plants with a total capacity of 10,980 c.f.s. are included in the aforementioned MR&T Project. These works should also be completed not later than 1985 (again excepting

the 122 miles of channel improvement shown in 2020). The authorized, unconstructed works constitute about one half of the tabulated structural flood control plan for principal streams.

The remainder of the structural component of the flood control plan consists of improvements needed and which appear to be economically feasible. These works are listed as "proposed" on table 104. Three major reservoirs having a total flood control storage capacity of 309,000 acre-feet, 2,635 miles of channel improvement, 782 miles of new levees, and 68 major pumping plants and miscellaneous works for hurricane protection are included in the plan for principal stream improvements by the year 2020. Much of this work is currently under a more detailed phase of study which could lead to authorization within a few years, and some will be authorized before this study is completed. The remainder must be studied in more detail and, if found to be justified, should be authorized and subsequently constructed by the time frames indicated in table 106. Most of the proposed work on principal streams in all but the coastal planning areas (WRPA's 8, 9, and 10) is for reduction of damages due to headwater flooding on principal tributaries in the region. The proposed work in the coastal areas is primarily a combination of hurricane protection projects and headwater flood protection projects. Improvements to principal streams will not only aid in flood damage reduction along principal streams but will also help relieve upstream watershed flood problems since principal streams serve as the outlets for those watersheds. The upstream watersheds contain about half of the total flood damage potential in the Lower Mississippi Region and about two-thirds of the agricultural damages. In order to relieve as much of the problem as is estimated to be economically feasible, a total of 1,461 flood-water retarding reservoirs with a total flood control storage of 1,922,000 acre-feet, 21,457 miles of channel improvement, about 60 miles of levees, one pumping plant, and a large but undetermined number of water control structures are needed by the year 2020. These upstream watershed improvements, which represent the bulk of the regional flood control plan, should be studied in more detail, authorized, and constructed by the time frames indicated on table 106.

Nonstructural Measures. Nonstructural measures in the plan consist of land treatment, provision of technical assistance, and general watershed management for all rural agricultural areas, and for technical assistance and flood plain information reports necessary to proper flood plain management in all urban and built-up areas, regardless of whether or not structural measures are included for those areas. Forty-three urban areas have been or are in the process of being provided with flood plain information reports and an additional sixty-eight urban areas are programmed for reports. Readily identifiable elements of the nonstructural program are summarized in table 107. In addition to those, flood forecast services, and hurricane, storm surge, and storm tide forecast programs have been valuable assets over the past few years and these programs will undoubtedly continue.

Table 107 - Flood Control Plan, Non-Structural Measures, Program A, Lower Mississippi Region

WRPA/Time Frame		Land Treatment and Technical Assistance (Acres) 1/	Rural-Built up Floodplain Management (Acres)	Watershed Management (Acres)	Floodplain Information Reports	
					Complete or Underway	Planned
1	1980	0	0	0	2/	2/
	2000	0	0	0		
	2020	0	0	0		
	TOTAL	0	0	0		
2	1980	3,192,000	2,236,510	8,034,240	6	22
	2000	3,568,000	86,813	291,200		
	2020	4,004,000	91,700	411,200		
	TOTAL	10,764,000	2,415,023	8,736,640		
3	1980	2,219,000	293,353	1,928,704	14	6
	2000	2,466,000	111,401	918,208		
	2020	2,678,000	114,643	668,480		
	TOTAL	7,363,000	519,397	3,515,392		
4	1980	3,118,000	1,369,963	4,737,222	4	5
	2000	3,570,000	23,524	130,720		
	2020	3,768,000	305,190	970,355		
	TOTAL	10,456,000	1,698,677	5,838,297		
5	1980	3,334,000	663,829	1,730,432	9	5
	2000	3,595,000	87,238	161,600		
	2020	4,062,000	503,462	1,283,136		
	TOTAL	10,991,000	1,254,529	3,175,168		
6	1980	1,251,000	1,464,492	1,876,224	0	1
	2000	1,407,000	111,315	317,056		
	2020	1,528,000	0	0		
	TOTAL	4,186,000	1,575,807	2,193,280		
7	1980	1,126,000	348,050	2,690,048	1	1
	2000	1,195,000	59,911	1,018,048		
	2020	1,379,000	0	0		
	TOTAL	3,700,000	407,961	3,708,096		
8	1980	831,000	734,254	1,504,512	3	8
	2000	793,000	218,464	1,225,088		
	2020	868,000	17,490	443,520		
	TOTAL	2,492,000	970,208	3,173,120		
9	1980	1,850,200	1,809,952	3,025,152	4	16
	2000	2,087,700	468,606	797,120		
	2020	2,211,600	0	0		
	TOTAL	6,149,500	2,278,558	3,822,272		
10	1980	666,000	337,083	669,248	2	4
	2000	630,000	334,856	530,304		
	2020	544,000	41,715	41,728		
	TOTAL	1,840,000	713,654	1,241,280		
LMR	1980	17,587,200	9,257,486	26,195,782	43	68
	2000	19,311,700	1,502,128	5,389,344		
	2020	21,042,600	1,074,200	3,818,419		
	TOTAL	57,941,500	11,833,814	35,403,545		

1/ Non-critical areas only. Critical area treatment is included in sediment and erosion programs.
2/ Are included in adjacent WRPA.

One of the most effective nonstructural solutions to urban flood plain growth problems is the flood insurance program which requires effective zoning to prevent additional damageable growth in flood plains. In this regard, however, it is important to recognize that the vast Alluvial Valley flood plain would be submersed in its entirety if the River were allowed to spread out in time of flood without any confinement. It is therefore not comparable to most other flood plains. The River does not need to inundate a flood plain 25 to 80 miles wide. Moreover, long established urban and agricultural activity in this rich land area must be assured of every right to continue to grow and prosper.

The plan requires that local interests appropriately utilize flood plain information supplied by the various Federal agencies and vigorously pursue a program of intelligent management of the region's flood plains. Yet, a nonstructural program cannot solve existing flood problems, nor can it solve most of the future problems since damages increase largely because of expected increases in yields in rural agricultural areas and increased value of developments already in flood plains. Both the nonstructural and structural components of the flood control plan are essential to a viable regional economy and the public health and welfare.

Plan Effectiveness. If implemented as described, the flood control plan will prevent $113.6 million or about 40 percent of the expected average annual flood damage levels in 1980, $184.8 million or 49 percent in 2000, and $258.7 or 50 percent in 2020. It is worthwhile to note that these are average annual damages prevented, based on flood protection conditions as of 1970. Assuming a straight line relationship from time frame to time frame, in the study period 1970 to 2020 total damages prevented by the plan will amount to nearly $8 billion, a significant reduction in waste of resources not only to the region but also to the Nation. Table 108 provides a detailed breakdown of average annual damages which would be prevented with the plan fully implemented. These damages prevented are those which would result from implementation of the plan shown in table 106 only. Were the damages to be prevented by completion of the backlog of projects included, the estimates would be greatly increased.

The estimate of average annual damages which would still exist even with the plan in place is shown in table 109. Hopefully, as more detailed studies are conducted and as nonstructural flood plain management is exercised, the residual damages can be further decreased.

The flood control plan as presently formulated will eliminate 45 percent of the region's urban damages and about 57 percent of agricultural and other damages. The large remaining urban damage potential is principally due to hurricane-induced tidal flooding in coastal areas where additional hurricane protection works (levees, interior drainage facilities, etc.) over and above those in the plan and those already under construction cannot be economically justified in the foreseeable future. The efficiency of the plan is shown by planning area in table 110.

Table 108 - Average Annual Flood Damages Prevented ($1,000) by Flood Control Plan,[1/] National Income Objective, Lower Mississippi Region

	Principal Streams								
	1980			2000			2020		
WRPA	Urban	Non-Urban	Total	Urban	Non-Urban	Total	Urban	Non-Urban	Total
1	0	0	0	0	0	0	0	0	0
2	804	6,577	7,381	3,450	13,468	16,918	7,877	16,143	24,020
3	3,331	1,340	4,671	7,520	2,805	10,325	13,384	3,719	17,103
4	662	9,415	10,077	1,568	13,387	14,955	2,244	18,958	21,202
5	556	1,675	2,231	988	4,204	5,192	1,546	5,304	6,850
6	1	784	785	47	1,609	1,656	55	1,883	1,938
7	17	188	205	421	219	640	573	255	828
8	0	18	18	33	21	54	293	32	325
9	466	334	800	1,219	392	1,611	2,147	505	2,652
10	1,141	0	1,141	5,582	0	5,582	10,418	0	10,418
LMR	6,978	20,331	27,309	20,828	36,105	56,933	38,537	46,799	85,336

	Upstream Watersheds								
	1980			2000			2020		
WRPA	Urban	Non-Urban	Total	Urban	Non-Urban	Total	Urban	Non-Urban	Total
1	0	0	0	0	0	0	0	0	0
2	3	26,406	26,409	6	36,088	36,094	10	47,325	47,335
3	1,140	2,827	3,967	2,134	5.505	7,639	5,368	9,181	14,549
4	1	15,830	15,831	2	19,475	19,477	4	28,171	28,175
5	82	9,604	9,686	231	13,085	13,316	438	16,872	17,310
6	0	12,793	12,793	50	16,281	16,331	98	19,680	19,778
7	0	2,744	2,744	33	3,920	3,953	61	5,284	5,345
8	889	1,964	2,853	1,955	3,607	5,562	3,485	5,064	8,549
9	42	5,317	5,359	94	7,481	7,575	169	8,796	8,965
10	801	1,606	2,407	1,411	3,742	5,153	2,449	4,409	6,858
LMR	2,958	79,091	82,049	5,916	109,184	115,100	12,082	144,782	156,864

1/ As shown in table 106 only. Completion of entire backlog of projects now under construction will greatly increase the above.

Table 109 - Residual Average Annual Flood Damages ($1,000), with Flood Control Plan in Place, National Income Objective, Lower Mississippi Region

Planning Area	1980 Principal Streams	1980 Upstream Watersheds	1980 Total	2000 Principal Streams	2000 Upstream Watersheds	2000 Total	2020 Principal Streams	2020 Upstream Watersheds	2020 Total
1	3,929	0	3,929	4,470	0	4,470	5,119	0	5,119
2	29,960	15,628	45,588	24,993	17,579	42,572	31,022	21,907	52,929
3	13,904	6,542	20,446	18,047	7,323	25,370	28,477	6,775	35,252
4	10,362	13,183	23,545	10,227	16,035	26,262	10,774	15,324	26,098
5	5,889	7,663	13,552	4,692	8,970	13,662	5,538	11,641	17,179
6	3,572	7,187	10,759	2,955	7,694	10,649	2,828	9,327	12,155
7	2,297	1,847	4,144	2,587	1,969	4,556	3,616	2,637	6,253
8	1,329	2,317	3,646	2,060	1,823	3,883	3,132	2,352	5,484
9	4,789	5,067	9,856	5,102	5,511	10,613	5,410	6,508	11,918
10	33,249	3,943	37,192	48,019	3,141	51,160	71,916	3,687	75,603
LMR	109,280	63,377	172,657	123,602	70,045	193,197	167,852	80,158	247,990

Table 110 - Effectiveness of Flood Control Plan, National Income Program, Lower Mississippi Region

WRPA	Damages Prevented in 2020 Urban (Percent)	Damages Prevented in 2020 Non-Urban (Percent)
1	-	-
2	86	53
3	44	54
4	74	65
5	69	58
6	45	65
7	22	58
8	55	68
9	49	49
10	16	37
LMR	46	57

Sediment and Erosion

The control of erosion at its source is essential to maintaining the production potential of the region's cropland and pastureland. Furthermore, it is the key to alleviating subsequent problems of turbidity and suspended matter in the region's rivers and streams and of damaging sediment deposits on agricultural and other lands. Hence, the sediment and erosion plan for the National Income Program is composed of probable feasible measures for controlling the loss of topsoil from open areas with critical erosion problems, and for controlling the erosion of roadbanks and streambanks. The basic ingredient of the plan is the conversion of critically eroding open lands to vegetation, along with technical assistance to landowners. This ingredient combined with the stabilization of about 11,300 miles of roadbanks and 2,100 miles of streambanks (excluding the main stem of the Mississippi River in WRPA 1) will take care of the most critical regional needs for sediment and erosion control through the year 2020.

The sediment and erosion problem in WRPA 1 is nearly 100 percent the result of bank caving along the main stem of the Mississippi River although some minor amount of eroded material is also contributed from sheet erosion affecting 29,000 acres in the batture area. Control of sediment and erosion is a significant and integral part of the channel improvement feature of the continuing Mississippi River and Tributaries Project even though alleviation of this problem is not addressed per se; rather, it is a windfall benefit of works to maintain channel depths for navigation and works to insure the integrity of the flood control features of the project. The Channel Improvement Feature of the Mississippi River and Tributaries Project requires continued adequate funding to see it to a timely completion. No new investment is required to solve the sediment and erosion problem of WRPA 1, which represents only 6 percent of the total regional problem. Thus, WRPA 1 is omitted from the following plan. Funding requirements are discussed in a later section dealing with total investments (pages 303 to 334).

The WRPA composition of the plan is given in table 111. To achieve the maximum contribution to the National Income objective, the primary thrust of the plan is directed to reclamation of approximately 1.4 million acres by replanting forests, grasses, and legumes in critically eroding areas. The mix of revegetation measures varies from over 70 percent reforestation and 30 percent planting of grasses and legumes in WRPA 6 to about 40 percent reforestation and 60 percent grasses and legumes in WRPA 3, with a regional average split of about 52 percent reforestation and 48 percent planting to grasses and legumes. Major emphasis is on WRPA's such as 3, 4, and 7, where lands marginal for cropping were historically cleared and planted, only to be abandoned when landowners failed to realize the economic returns envisioned. Revegetation as a plan measure is limited almost exclusively to areas subject to sheet erosion; an insignificant amount of revegetation may be applied to the reclamation of areas subject to other types of erosion. About 4 percent of the regional acreage with a foreseeable erosion problem in the year 1980 can be reclaimed through revegetation measures. This percentage can be increased to nearly 7 percent by the year 2000 and to almost 8 percent by the year 2020.

Roadbank stabilization measures are limited in application to 80 percent of the erosion problem areas because it is impossible to get full participation by the public in carrying out roadbank stabilization practices. Hence, the Sediment and Erosion Plan calls for measures to stabilize 11,330 miles of the region's 14,162 miles of roadbanks (42,487 acres) needing treatment for erosion. Of this, 4,500 miles are included in the 1980 time frame. An additional 4,000 miles are included as a year 2000 measure, and the remaining 25 percent are included in the year 2020.

Measures directed at control of streambank erosion, excluding the Mississippi River main stem, include structural measures such as contour farming, ditch checks, and reservoirs to retard erosion causing runoff.

Table III -Sediment and Erosion Plan, NI Objective, Lower Mississippi Region .

WRPA/Time Frame		Planting of Vegetation in Critical Areas (Acres) 1/ — Forests: Incremental	Forests: Cumulative	Grasses and Legumes: Incremental	Grasses and Legumes: Cumulative	Total: Incremental	Total: Cumulative	Roadside Erosion Control (Miles) 1/: Incremental	Roadside Erosion Control (Miles) 1/: Cumulative
2	1980	36,700	36,700	27,800	27,800	64,500	64,500	441	441
	2000	14,600	51,300	15,000	42,800	29,600	94,100	386	827
	2020	9,700	61,000	10,000	52,800	19,700	113,800	275	1,102
3	1980	117,600	117,600	175,700	175,700	293,300	293,300	554	554
	2000	47,000	164,600	100,500	276,200	147,500	440,800	485	1,039
	2020	31,400	196,000	17,400	293,600	48,800	489,600	346	1,385
4	1980	154,200	154,200	81,900	81,900	236,100	236,100	806	806
	2000	61,700	215,900	65,800	147,700	127,500	363,600	705	1,511
	2020	41,100	257,000	29,400	177,100	70,500	434,100	503	2,014
5	1980	26,400	26,400	25,400	25,400	51,800	51,800	1,174	1,174
	2000	10,600	37,000	6,400	31,800	17,000	68,800	1,028	2,202
	2020	7,000	44,000	4,300	36,100	11,300	80,100	734	2,936
6	1980	6,100	6,100	2,200	2,200	8,300	8,300	165	165
	2000	2,300	8,400	900	3,100	3,200	11,500	145	310
	2020	1,600	10,000	600	3,700	2,200	13,700	103	413
7	1980	76,100	76,100	59,800	59,800	135,900	135,900	524	524
	2000	30,500	106,600	10,600	70,400	41,100	177,000	458	982
	2020	20,400	127,000	7,000	77,400	27,400	204,400	327	1,309
8	1980	10,900	10,900	10,000	10,000	20,900	20,900	232	232
	2000	4,300	15,200	1,400	1,400	5,700	26,600	203	435
	2020	2,800	18,000	700	12,100	3,500	30,100	145	580
9	1980	5,400	5,400	2,500	2,500	7,900	7,900	599	599
	2000	2,400	7,800	1,100	3,600	3,500	11,400	524	1,123
	2020	1,200	9,000	400	4,000	1,600	13,000	374	1,497
10	1980	3,100	3,100	900	900	4,000	4,000	38	38
	2000	900	4,000	200	1,100	1,100	5,100	33	71
	2020	0	4,000	0	1,100	0	5,100	23	94
LMR	1980	436,500	436,500	386,200	386,200	822,700	822,700	4,533	4,533
	2000	174,300	610,800	201,900	588,100	376,200	1,198,900	3,967	8,500
	2020	115,200	726,000	69,800	657,900	185,000	1,383,900	2,830	11,330

1/ Treatment and technical assistance in addition to that existing in 1970. Excludes main stem, Mississippi River.

Table 111 - Sediment and Erosion Plan, NI Objective, Lower Mississippi Region (Cont'd)

WRPA/Time Frame		Streambank Erosion Control (Miles)1/ Upstream Watersheds Incremental	Upstream Watersheds Cumulative	Principal Reaches Incremental	Principal Reaches Cumulative	Subtotal Incremental	Subtotal Cumulative	Total Miles of Roadbanks and Streambanks Incremental	Total Miles of Roadbanks and Streambanks Cumulative
2	1980	68	68	60	60	128	128	569	569
	2000	41	109	8	68	49	177	435	1,004
	2020	27	136	9	77	36	213	311	1,315
3	1980	348	348	21	21	369	369	923	923
	2000	208	556	14	35	222	591	707	1,630
	2020	139	695	13	48	152	743	498	2,128
4	1980	238	238	28	28	266	266	1,072	1,072
	2000	143	381	48	76	191	457	896	1,968
	2020	95	476	48	124	143	600	646	2,614
5	1980	76	76	0	0	76	76	1,250	1,250
	2000	45	121	5	5	50	126	1,078	2,328
	2020	30	151	5	10	35	161	769	3,097
6	1980	42	42	0	0	42	42	207	207
	2000	26	68	11	11	37	79	182	389
	2020	17	85	11	22	28	107	131	520
7	1980	106	106	0	0	106	106	630	630
	2000	64	170	3	3	67	173	525	1,155
	2020	42	212	2	5	44	217	371	1,526
8	1980	40	40	0	0	40	40	272	272
	2000	24	64	0	0	24	64	227	499
	2020	16	80	0	0	16	80	161	660
9	1980	8	8	0	0	8	8	607	607
	2000	3	11	0	0	3	11	527	1,134
	2020	4	15	0	0	4	15	378	1,512
10	1980	2	2	0	0	2	2	40	40
	2000	1	3	0	0	1	3	34	74
	2020	1	4	0	0	1	4	24	98
LMR	1980	928	928	109	109	1,037	1,037	5,570	5,570
	2000	555	1,483	89	198	644	1,681	4,611	10,181
	2020	371	1,854	88	286	459	2,140	3,289	13,470

1/ Treatment and technical assistance in addition to that existing in 1970. Excludes main stem, Mississippi River.

Such measures applied to problem areas in both upstream watersheds and along principal streams will collectively control streambank erosion on 7 percent of the problem streams in 1980, 12 percent in 2000, and 15 percent in the year 2020. An additional plan component which is used in conjunction with all of the above measures throughout the region is watershed management in the form of land treatment measures such as changing cropping patterns, changing land cover crops, and improving existing tillage practices.

By implementing the plan, damages from sediment and erosion could be reduced by an average of nearly $7 million per year to 1980, slightly over $13 million per year between 1980 and 2000, and nearly $20 million per year for the period 2000 to 2020. These figures represent roughly 38, 60, and 72 percent overall effectiveness of the sediment and erosion plan for 1980, 2000, and 2020, respectively, when compared to predicted damages of $17.8 million, $21.9 million, and $27.3 million, respectively. Effectiveness of the plan by WRPA is given in table 112. It is estimated that the land treatment measures, though less than 100 percent effective in solving the sediment and erosion problems, will satisfactorily support the agricultural production estimates. However, continued surveillance of the effectiveness of the land treatment measures will be required to substantiate these estimates.

<u>Drainage</u>

The orderly removal of excess surface water from cropland and pastureland will be required in future years to improve agricultural production efficiency, thereby helping to increase yields to meet expanding food and fiber needs. The drainage plan for the National Income Program includes over 21,000 miles of on-farm ditches, nearly 13,000 miles of secondary ditches, and approximately 9,500 miles of project channels for drainage. The plan also calls for improved row arrangement, field diversion terraces, and similar watershed management practices (land treatment) to enhance the production potential of agricultural lands with a drainage problem.

The recommended drainage measures summarized in table 113 will solve 55 percent of identified regional drainage problems through the year 2020. On-farm drains comprised of V and W ditches and secondary ditches account for 35 percent; these combined with watershed management increase the percentage to 50 percent; when project channels are added to complete the plan, it provides for satisfactory removal of excess water from 6.5 million acres of the region's nearly 12 million acres predicted to have a drainage problem in 2020.

The plan places major emphasis on drainage of agricultural lands in WRPA's such as 2, which are the region's prime crop producers. Plan effectiveness varies widely by WRPA, with a low of 3 percent in WRPA 3 in 1980 and a high of 80 percent in WRPA 5 in 2020. Table 114 gives a summary of needs met by the drainage plan. Of the identified regional needs, 13 percent can be met in 1980, 35 percent in 2000, and 55 percent in the year 2020.

Table 112 - Plan Effectiveness, Sediment and Erosion Plan, Regional Development Program, Lower Mississippi Region

WRPA	Time Frame	Total ($1,000)	Average Annual Damages[1/] Prevented by Plan ($1,000)	Remaining Damages ($1,000)	Plan Effectiveness (Percent)
2	1970	905			
	1980	1,025	391	634	38
	2000	1,159	713	446	62
	2020	1,230	946	284	77
3	1970	7,728			
	1980	8,846	3,364	5,482	38
	2000	12,212	7,234	4,978	59
	2020	16,612	11,713	4,899	71
4	1970	2,723			
	1980	3,775	1,470	2,305	39
	2000	4,440	2,734	1,706	62
	2020	4,888	3,683	1,205	75
5	1970	509			
	1980	633	225	408	36
	2000	748	419	329	56
	2020	813	620	193	76
6	1970	359			
	1980	488	195	293	40
	2000	598	354	244	59
	2020	692	509	183	74
7	1970	1,540			
	1980	2,038	783	293	38
	2000	2,241	1,361	880	61
	2020	2,476	1,810	666	73
8	1970	975			
	1980	969	373	596	38
	2000	1,153	695	458	60
	2020	1,340	973	367	73
9	1970	47			
	1980	74	23	51	31
	2000	121	68	53	56
	2020	209	150	59	72
10	1970	66			
	1980	60	24	36	40
	2000	61	37	24	61
	2020	53	42	11	79
LMR	1970	14,851			
	1980	17,906	6,848	11,058	38
	2000	22,735	13,615	9,120	60
	2020	28,313	20,446	7,867	72

1/ Cumulative by time period. Sediment and erosion damages in WRPA 1 are discussed in conjunction with the MR&T Project.

Table 113 - Drainage Plan, NI Objective, Lower Mississippi Region

		Structural Measures										Nonstructural Measures 1/	
		On Farm Drains (Miles)						Project Channels for Drainage (Miles) 2/		Total Drains and Channels		Watershed Management (acres)	
		V and W Ditches		Secondary Ditches		Subtotal							
WRPA/Time Frame		Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
2	1980	1,580	1,580	950	950	2,530	2,530	2,400	2,400	4,930	4,930	474,300	474,300
	2000	3,160	4,740	1,900	2,850	5,060	7,590	20	2,420	5,080	10,010	948,400	1,422,700
	2020	3,160	7,900	1,890	4,740	5,050	12,640	70	2,490	5,120	15,130	948,500	2,371,200
3	1980	60	60	40	40	100	100	40	40	140	140	16,100	16,100
	2000	100	160	60	100	160	260	80	120	240	380	32,200	48,300
	2020	110	270	60	160	170	430	60	180	230	610	32,300	80,600
4	1980	980	980	600	600	1,580	1,580	2,460	2,460	4,040	4,040	294,900	294,900
	2000	1,960	2,940	1,170	1,770	3,130	4,710	0	2,460	3,130	7,170	589,800	884,700
	2020	1,940	4,880	1,160	2,930	3,100	7,810	0	2,460	3,100	10,270	589,800	1,474,500
5	1980	370	370	220	220	590	590	320	320	910	910	114,600	114,600
	2000	750	1,120	450	670	1,200	1,790	110	430	1,310	2,220	229,100	343,700
	2020	710	1,830	440	1,110	1,150	2,940	220	650	1,370	3,590	229,100	572,800
6	1980	440	440	280	280	720	720	740	740	1,460	1,460	131,700	131,700
	2000	860	1,300	520	800	1,380	2,100	180	920	1,560	3,020	263,400	395,100
	2020	850	2,150	500	1,300	1,350	3,450	0	920	1,350	4,370	263,400	658,500
7	1980	80	80	50	50	130	130	280	280	410	410	21,400	21,400
	2000	130	210	80	130	210	340	40	320	250	660	42,800	64,200
	2020	140	350	90	220	230	570	0	320	230	890	42,800	107,000
8	1980	70	70	40	40	110	110	430	430	540	540	20,800	20,800
	2000	140	210	90	130	230	340	160	590	390	930	41,600	62,400
	2020	140	350	90	220	230	570	0	590	230	1,160	41,600	104,000
9	1980	630	630	380	380	1,010	1,010	1,200	1,200	2,210	2,210	196,800	196,800
	2000	1,270	1,900	770	1,150	2,040	3,050	200	1,400	2,240	4,450	393,500	590,300
	2020	1,250	3,150	750	1,900	2,000	5,050	0	1,400	2,000	6,450	393,600	983,900
10	1980	80	80	50	50	130	130	300	300	430	430	25,800	25,800
	2000	160	240	100	150	260	390	160	460	420	850	51,700	77,500
	2020	150	390	100	250	250	640	40	500	290	1,140	51,600	129,100
LMR	1980	4,290	4,290	2,610	2,610	6,900	6,900	8,170	8,170	15,070	15,070	1,296,400	1,296,400
	2000	8,530	12,820	5,140	7,750	13,670	20,570	950	9,120	14,620	29,690	2,592,500	3,888,900
	2020	8,450	21,270	5,080	12,830	13,530	34,100	390	9,510	13,920	43,610	2,592,700	6,481,600

1/ Measures additional to those existing in 1970.
2/ Drainage channels included in Flood Control Plan for upstream watersheds.

Table 114, Plan Effectiveness, Drainage Plan, NI Objective, Lower Mississippi Region

WRPA/Time Frame		Drainage Needs1/ (1,000 Acres)	Need Met by Proposed Drainage Measures (1,000 Acres)			
			On Farm Drains	On Farm Drains Plus Watershed Management	On Farm Drains Plus Watershed Management Plus Project Channels	Plan Effectiveness2/ (Percent)
2	1980	3,370	147	213	474	14
	2000	3,620	441	640	1,423	39
	2020	3,700	735	1,067	2,371	64
3	1980	520	9	11	16	3
	2000	570	27	33	48	8
	2020	620	43	53	81	13
4	1980	1,930	80	121	295	15
	2000	2,060	239	363	885	43
	2020	2,210	413	634	1,474	67
5	1980	510	45	60	114	22
	2000	620	137	182	344	55
	2020	720	235	309	573	80
6	1980	1,130	38	57	132	12
	2000	1,190	115	170	395	33
	2020	1,250	191	283	658	53
7	1980	380	15	17	21	6
	2000	410	45	51	64	16
	2020	440	75	86	107	24
8	1980	180	9	12	21	12
	2000	200	28	36	62	31
	2020	230	47	60	104	45
9	1980	2,000	112	150	197	10
	2000	2,200	325	449	590	27
	2020	2,340	531	738	984	42
10	1980	160	3	5	26	16
	2000	190	8	16	78	41
	2020	230	13	26	129	56
LMR	1980	10,180	458	646	1,296	13
	2000	11,060	1,365	1,940	3,889	35
	2020	11,740	2,283	3,256	6,481	55

1/ See Appendix I, Agricultural Land Drainage
2/ Plan is 100 percent effective in all WRPA's and all time frames in terms of meeting absolute needs for food and fiber production.

Water Quality Management.

The water quality plan included in the National Income Program is displayed in table 115 and is presented graphically in figure 17. The plan deals specifically with the problems of biodegradable organic wastes and bacteria, and with solutions judged technically feasible at this time. It deals only generally with other pollutants such as thermal wastes, nutrients, toxics, dissolved solids, and exotics.

In view of the fact that guidance for major features of the Federal Water Quality Act Amendments of 1972 concerning "best practicable treatment currently available" and "best available treatment economically achievable" has not yet been published by the Environmental Protection Agency and because of the treatment backlog in existence in the Lower Mississippi Region, it is unrealistic from a physical construction standpoint to expect all municipalities to realize secondary treatment by July 1, 1977. Accordingly, the water quality plan is considered as complying with the 1972 Federal Water Quality Act Amendments in line with the current interpretation being given that Act by allowing for the highest possible level of treatment in the shortest possible time span, utilizing a range of options which include not only treatment but also assimilation and reaeration, while also taking into account State Stream Standards and physical and budgetary constraints. All of these considerations result in attainment of secondary treatment somewhat later than specified in the 1972 Act.

The primary requirement for the Program A water quality plan is that all municipalities attain secondary treatment by 1980, advanced treatment by 2000, and continued advanced treatment through 2020. Industries are required to attain equivalent levels of treatment. Lacking guidance to the contrary, these equivalent levels of treatment are considered to be "Best Practicable Control Technology Currently Available" in the short term and "Best Available Technology Economically Achievable" in the longer range picture. These levels of 5-day BOD reduction are 96 percent corresponding with advanced waste treatment, (96 percent reduction in BOD_5 for municipalities), respectively.

Where these levels of treatment do not provide an effluent whose 5-day BOD can be assimilated by receiving streams without violation of stream standards, treatment and assimilation are supplemented by mechanical reaeration. This option is used in all WRPA's except 7. It is used to satisfy 11,000 and 13,000 pounds of BOD5 in WRPA's 6 and 10, respectively, in the year 2020. In all the other planning areas, in all time frames, it is used to remove less than 10,000 pounds. Chlorination is included in all time frames and is applied to all municipal waste discharges in sufficient strength to prevent problems from pathological bacteria.

Non-BOD pollutants were not quantified because of a dearth of information and rampant contradictions that surfaced in attempts to address the subject in specific terms. Data on alternatives and costs of treatment for these pollutants were catalogued, but a meaningful program

Table 115 - Water Quality Plan, Program A, Lower Mississippi Region

Municipal and Industrial Organic Waters

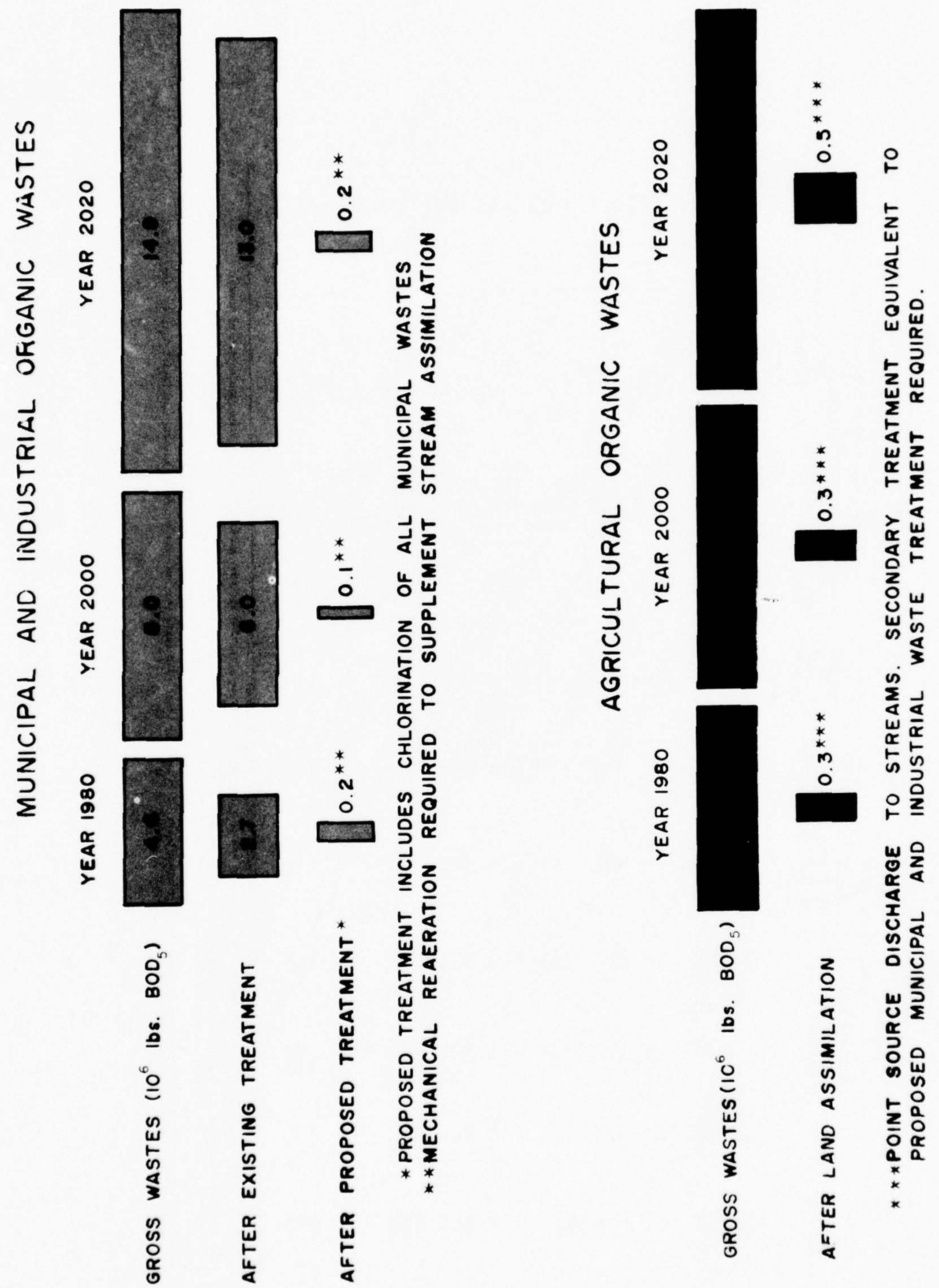
WRPA	Time Frame	Municipal: Gross BOD_5 Loading (1,000 lbs.)	Municipal: BOD_5 Removal (1,000 lbs.): Existing Treatment 1/	Municipal: BOD_5 Removal: Proposed Treatment 2/	Municipal: BOD_5 Removal: Stream Assimilation 3/	Municipal: BOD_5 Removal: Mechanical Reaeration	Municipal: Remaining BOD_5 Load (1,000 lbs.)	Industrial: Gross BOD_5 Loading (1,000 lbs.)	Industrial: BOD_5 Removal (1,000 lbs.): Existing Treatment 1/	Industrial: BOD_5 Removal: Proposed Treatment 4/	Industrial: BOD_5 Removal: Stream Assimilation 3/	Industrial: BOD_5 Removal: Mechanical Reaeration	Industrial: Remaining BOD_5 Load (1,000 lbs.)
2	1980	62	43	14	3	2	0	45	21	23	1	0	0
	2000	82	43	37	1	1	0	78	21	55	1	1	0
	2020	114	43	69	1	1	0	151	21	128	1	1	0
3	1980	193	34	140	18	1	0	490	192	281	13	4	0
	2000	288	34	249	4	1	0	969	192	760	13	4	0
	2020	403	34	362	7	0	0	1,991	192	1,765	26	8	0
4	1980	53	23	25	4	1	0	112	51	56	4	1	0
	2000	71	23	47	1	0	0	194	51	139	3	1	0
	2020	97	23	72	2	0	0	382	51	323	7	1	0
5	1980	79	46	26	5	2	0	1,046	456	567	22	1	0
	2000	108	46	60	1	1	0	1,867	456	1,391	19	1	0
	2020	146	46	98	2	0	0	3,643	456	3,148	37	2	0
6	1980	16	8	7	1	0	0	179	92	81	0	6	0
	2000	18	8	9	0	1	0	291	92	194	0	5	0
	2020	21	8	12	0	1	0	549	92	447	0	10	0
7	1980	10	4	5	1	0	0	226	99	118	9	0	0
	2000	13	4	9	0	0	0	397	99	290	8	0	0
	2020	18	4	13	1	0	0	765	99	651	15	0	0
8	1980	58	23	29	6	0	0	508	197	294	17	0	0
	2000	84	23	59	2	0	0	948	197	735	16	0	0
	2020	115	23	89	2	1	0	1,947	197	1,718	32	0	0
9	1980	90	40	40	7	3	0	506	223	269	7	7	0
	2000	115	40	72	2	1	0	827	223	593	2	9	0
	2020	144	40	100	3	1	0	1,483	223	1,239	9	12	0
10	1980	222	92	109	19	2	0	736	289	428	17	2	0
	2000	302	92	204	5	1	0	1,325	289	1,019	14	3	0
	2020	397	92	297	7	1	0	2,540	289	2,219	29	3	0
LMR	1980	783	313	395	64	11	0	3,848	1,620	2,117	90	21	0
	2000	1,081	313	746	16	6	0	6,896	1,620	5,176	76	24	0
	2020	1,455	313	1,112	25	5	0	13,451	1,620	11,638	156	37	0

1/ Treatment level as of 1970.
2/ Conventional secondary treatment to achieve 90 percent BOD_5 removal by 1980, and advanced treatment to achieve 98 percent removal by 2000, with continued 98 percent removal through 2020.
3/ Assimilative capacity of receiving streams at point sources of effluent discharges.
4/ Conventional secondary treatment to achieve 96 percent BOD_5 removal (equivalent to 90 percent for municipalities) by 1980, and advance treatment to achieve 98 percent removal by 2000, with continued 98 percent removal through 2020.

Table 115- Water Quality Plan, Program A, Lower Mississippi Region (cont'd)

		Agricultural Organic Wastes						Inorganic Wastes: Bacteriological Wastes				
		Gross BOD_5	Land Assimilation (1,000 lb.)		Potential		Remaining	Bacterial	Bacteria Control (mgd)			
WRPA	Time Frame	Wastes 5/ (1,000 lbs.)	Existing 6/	Future 7/	Discharge To Streams 8/ (1,000 lbs.)	Proposed Treatment 9/ (1,000 lbs.)	BOD_5 Discharge (1,000 lbs.)	Effluent Discharge (mgd)	Existing Chlorination 10/	Proposed Chlorination	Unchlorinated Discharge (mgd)	Other Pollutants
2	1980	711	553	130	28	28	0	43.4	3.5	39.9	0	11/
	2000	950	553	360	37	37	0	60.0	3.5	56.5	0	11/
	2020	1,263	553	662	48	48	0	86.3	3.5	82.8	0	11/
3	1980	1,004	785	175	44	44	0	141.1	27.3	113.8	0	11/
	2000	1,336	785	493	58	58	0	216.8	27.3	189.5	0	11/
	2020	1,774	785	914	75	75	0	308.2	27.3	280.9	0	11/
4	1980	1,123	863	221	39	39	0	49.6	4.0	45.6	0	11/
	2000	1,478	863	568	47	47	0	67.4	4.0	63.4	0	11/
	2020	1,968	863	1,042	63	63	0	92.8	4.0	88.8	0	11/
5	1980	1,367	1,009	292	66	66	0	43.8	19.0	24.8	0	11/
	2000	1,857	1,009	759	89	89	0	58.1	19.0	39.1	0	11/
	2020	2,481	1,009	1,353	119	119	0	83.0	19.0	64.0	0	11/
6	1980	462	361	90	11	11	0	6.7	4.6	2.1	0	11/
	2000	619	361	244	14	14	0	7.9	4.6	3.3	0	11/
	2020	828	361	449	18	18	0	9.6	4.6	5.0	0	11/
7	1980	580	443	114	23	23	0	8.0	1.9	6.1	0	11/
	2000	779	443	305	31	31	0	10.8	1.9	8.9	0	11/
	2020	1,037	443	554	40	40	0	15.2	1.9	13.3	0	11/
8	1980	622	500	98	24	24	0	45.6	25.2	20.4	0	11/
	2000	825	500	293	32	32	0	69.5	25.2	44.3	0	11/
	2020	1,087	500	546	41	41	0	101.5	25.2	76.3	0	11/
9	1980	834	659	149	26	26	0	76.9	44.5	32.4	0	11/
	2000	1,112	659	420	33	33	0	106.1	44.5	61.6	0	11/
	2020	1,478	659	777	42	42	0	143.5	44.5	99.0	0	11/
10	1980	112	88	21	3	3	0	208.8	134.7	74.1	0	11/
	2000	150	88	58	4	4	0	272.7	134.7	138.0	0	11/
	2020	200	88	107	5	5	0	350.0	134.7	215.3	0	11/
LMR	1980	6,815	5,261	1,290	264	264	0	623.9	264.7	359.2	0	11/
	2000	9,106	5,261	3,500	345	345	0	869.3	264.7	604.6	0	11/
	2020	12,116	5,261	6,404	451	451	0	1,190.1	264.7	925.4	0	11/

5/ Organic wastes from livestock and poultry including both point sources and non-point sources.
6/ Organic waste disposal as of 1970 by such methods as direct land application, aerated lagoon-irrigation systems, holding tanks, or some combination of these.
7/ Expected increase in assimilation on land areas in addition to 1970 disposal by this method.
8/ Waste discharges entering surface waters as equivalent point sources of pollution.
9/ Treatment consisting of the application of solid wastes to productive cropland at a rate which will provide nutrients that can be fully utilized by the crops.
10/ Treatment level as of 1970.
11/ Treatment of inorganic sediments included in sediment and erosion plan. Treatment of other pollutants (thermal wastes, heavy metals, nutrients, toxics, odor, color, phenolics, pH, oil and grease, dissolved solids, etc.) unspecified due to a lack of data.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

REGIONAL WATER QUALITY PLAN
NATIONAL INCOME OBJECTIVE

FIGURE 17

component for satisfaction of such needs obviously could not be developed. To generalize on pollutants as myriad and complex as non-BOD pollutants is to oversimplify, but the present state of the art permits no other recourse. In recognition of the need to place the total regional water pollution problem in the proper perspective, there is included herein (page 333) an assessment of general order costs involved in ameliorating this problem. These estimates were derived from data in the EPA publications, "The Cost of Clean Water," "The Economics of Clean Water," and "Industrial Pollution of the Mississippi River in Louisiana," freely applying approximations and judgment. Implementation of the National Income Objective water quality plan can satisfy all recognized 5-day BOD and bacterial pollutant loadings for all study time frames as indicated in the "remaining BOD_5 load" and "unchlorinated discharge" columns on table 115.

The region presently generates a total waste load of some 2 million pounds of 5-day BOD greater than is being treated or assimilated by land or water. The National Income Objective water quality plan contains measures designed to eliminate this backlog by year 1980 by a combination of measures including additional treatment, continued assimilation of agricultural wastes by land disposal (methods in use include direct land application, aerated lagoon-irrigation systems, holding tanks, or some combination of these), the use of the region's streams for assimilation where this can be done without violating dissolved oxygen requirements contained in State Stream Stream Standards and, to a limited extent, mechanical reaeration, to handle the minor amount of BOD_5 remaining after application of all other measures. Even though elimination of the water quality backlog detracts somewhat from maximization of the gross national product, it is nonetheless included as a Program A measure in recognition of national policy. Stream assimilation was allowed to vary by all time frames utilizing up to the total assimilative capacity of receiving streams before mechanical reaeration was applied to remaining loads. One constraining condition was, however, that once reaeration was used that same level was maintained through the next time period unless the particular planning area involved showed a consistent drop in need for this option. This was because reaeration involves physical measures of some sort and it is unrealistic to put these works on line in one period, abandon them the next, and add them again in the third time period. This adjustment involved only a very minor change in the mix of measures.

Navigation

In 1970 a little over one-fourth of the Nation's waterborne commerce moved through some part of the 3,418 miles of channels, 20 locks, 17 ports, and related facilities that made up the navigation system of the Lower Mississippi Region. The regional traffic amounted to 84 billion ton-miles during that year and is predicted to increase to 392 billion ton-miles by the year 2020. To meet the future needs for increased waterborne commerce in the region will require not only the improvement and expansion of existing navigation facilities, but also the construction of new facilities. The Congress has already authorized the improvement of 1,221 miles of the existing channels, the construction of 138 miles

of new channels, the rehabilitation of two existing locks, and the construction of one new lock; but even further additions will be required to fulfill the region's long term navigation needs.

The navigation plan summarized for the National Income Objective in table 116 calls for the continued operation and maintenance of the existing projects and timely construction of the authorized improvements, and proposes feasible additions thereto. The proposed additions include the enlargement of 942 miles of existing channels and the construction of 415 miles of new channels. The plan provides for the rehabilitation or replacement of six old locks, the construction of new locks at 10 locations, the expansion of 14 existing ports and the construction of 21 new ports. The provision of these facilities and a superport in the Gulf Coast area, together with the already existing and authorized navigation projects, will satisfy all identified regional navigation needs through the year 2020. About half of the proposed new facilities, including the superport, are required for needs satisfaction through the year 1980. The remainder fall within the category of long-term requirements.

Hydropower

The hydropower plan for the National Income Objective consists primarily of (1) the continued utilization of peak power produced by existing regional hydroelectric plants which provide a portion of the total hydroelectric energy generated in the power market area in which the Lower Mississippi Region is located and (2) the provision of all additional feasible hydroelectric power which can be developed in the Lower Mississippi Region. As outlined in Appendix R, as of 1970 the power market area contained 28 such plants, including four that are within the hydrologic boundary of the Lower Mississippi Region. The dependable capacity of the regional plants is 162,000 kilowatts, or 8 percent of the combined dependable hydroelectric plant capacity (1,939,500 kilowatts) of the market area.

Aside from existing plant facilities in the power market area, there are eight additional hydroelectric power plants under construction or definitely proposed within the market area. These scheduled plants have a combined dependable capacity of 1,022,600 kilowatts, and are expected to be in service by 1980. This means that by the end of 1980 the total dependable hydroelectric capacity in the power market area will amount to nearly 3,000 megawatts. There is no firm plan for additional plants beyond 1980.

Load forecasts and projected patterns of generation for the power market area indicate that the existing and scheduled hydropower facilities combined with existing and scheduled fuel-electric generating capacity (see Appendix R for details on fuel-electric generating capacity) will meet all foreseeable market area needs through year 1990. However, the nature of future loads indicates that all conventional hydroelectric power that can feasibly be developed within the region and substantial quantities of pumped storage capacity can be marketed in the power area.

Table 116 - Navigation Plan, Program A, Lower Mississippi Region

WRPA	Time Frame	Navigation Waterways (Miles): Deep Draft Channels: Existing[1]	Deep Draft: Authorized[2]	Deep Draft: Proposed[2]	Deep Draft: Total	Shallow Draft Channels: Existing[1]	Shallow Draft: Authorized[2]	Shallow Draft: Proposed[2]	Shallow Draft: Total	Navigation Locks: Existing[1]	Navigation Locks: Authorized[2]
1	1980	271	0	228(228)	271	720	718(718)	0	720	0	0
	2000			0	271			0	720		
	2020			0	271			0	720		
2	1980	0	0	0	0	328	0	200	528	4	0
	2000			0	0			0	528		
	2020			0	0			0	528		
3	1980	0	0	0	0	0	0	0	0	0	0
	2000			0	0			0	0		
	2020			0	0			0	0		
4	1980	0	0	0	0	189	163(163)	0	189	0	1
	2000			0	0			0	189		
	2020			0	0			0	189		
5	1980	0	0	0	0	351	0	0	351	4	0
	2000			0	0			0	351		
	2020			0	0			0	351		
6	1980	0	0	0	0	0	0	0	0	0	0
	2000			0	0			0	0		
	2020			0	0			0	0		
7	1980	0	0	0	0	0	0	0	0	0	0
	2000			0	0			0	0		
	2020			0	0			0	0		
8	1980	0	0	0	0	273	0	0	273	2	0
	2000			0	0			0	273		
	2020			0	0			0	273		
9	1980	100	3(3)	6(6)	100	705	238(238)	84(84)	705	4	1(1)
	2000			34(34)	100			270(255)	720		
	2020			200	300			0	720		
10	1980	81	55(3)	50(50)	133	400	182(96)	97(97)	486	6	1(1)
	2000			0	133			188(188)	486		
	2020			0	133			0	486		
LMR	1980	452	58(6)	284(284)	504	2,966	1,301(1,215)	381(181)	3,252	20	3(2)
	2000			34(34)	504			458(443)	3,267		
	2020			200	704			0	3,267		

1/ Active Federal projects and projects under construction as of 1970. Does not include existing private port facilities or existing Federal projects on which maintenance has been discontinued.
2/ Includes both new facilities and improvement of existing facilities. Total given first, with improvement indicated in parentheses. Proposed facilities are additional to existing and authorized facilities.

Table 116 - Navigation Plan, Program A, Lower Mississippi Region (Cont'd)

WRPA/Time Frame		Navigation Locks (Number)		Navigation Ports (Number)							
				Deep Draft				Shallow Draft			
		Proposed[2]	Total	Existing[1]	Authorized[2]	Proposed[2]	Total	Existing[1]	Authorized[2]	Proposed[2]	Total
1	1980	0	0	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
	2000	0	0			[3]	[3]			[3]	[3]
	2020	0	0			[3]	[3]			[3]	[3]
2	1980	0	4	0	0	0	0	4	0	2(1)	5
	2000	0	4			0	0			6(1)	10
	2020	0	4			0	0			1	11
3	1980	0	0	0	0	0	0	3	0	1(1)	3
	2000	0	0			0	0			1(1)	3
	2020	0	0			0	0			0	3
4	1980	1	2	0	0	0	0	3	0	7(3)	7
	2000	0	2			0	0			1(1)	7
	2020	0	2			0	0			2(2)	7
5	1980	2	6	0	0	0	0	1	0	5	6
	2000	0	6			0	0			2(1)	7
	2020	0	6			0	0			2	9
6	1980	0	0	0	0	0	0	1	0	3(1)	3
	2000	0	0			0	0			0	3
	2020	0	0			0	0			1(1)	3
7	1980	0	0	0	0	0	0	1	0	0	1
	2000	0	0			0	0			1(1)	1
	2020	0	0			0	0			0	1
8	1980	0	2	1	0	0	1	0	0	0	0
	2000	2(1)	3			0	1			0	0
	2020	1	4			0	1			0	0
9	1980	2(1)	5	2	0	0	2	2	0	0	0
	2000	2(1)	6			0	2			0	0
	2020	0	6			0	2			0	0
10	1980	1	7	1	0	0	1	0	0	0	0
	2000	2(1)	8			0	1			0	0
	2020	3(2)	9			0	1			0	0
LMR	1980	6(1)	26	4	0	1[4]	5[4]	13	0	18(6)	25
	2000	6(3)	29			0	5[4]			11(5)	31
	2020	4(2)	31			0	5[4]			6(3)	34

3/ Mississippi River ports listed with WRPA ports.
4/ Includes superport in Gulf Coast area.

Potential hydroelectric projects in the overall power market area and outside the confines of the Lower Mississippi Region include 20 conventional projects and 6 pumped storage projects with a combined dependable capacity of 5,062 megawatts. The output of these potential projects can be marketed within the region through interconnected operations in the power market area. Of these projects, the potential output from two conventional and three pumped storage projects might be available in 1980, with the output from the others possibly available in 1990. A summary of these projects is given in table 117.

Terrain features within the hydrologic confines of the region limit the hydroelectric power development potential mostly to expansion of existing projects. One exception is the DeGray project, Caddo River, Arkansas, under construction as of December 31, 1970, with a dependable capacity of 68.0 megawatts. An already planned addition thereto will increase this capacity to 108.0 kilowatts. Similar additions, totaling 34.6 MW at the Carpenter and Remmel projects, are being studies by their owner, Arkansas Power and Light Company, as a condition to renewing license No. 271 with the Federal Power Commission. Other such additions include 25.5 MW of potential capacity at Federal projects; 18 MW at the Sardis project on Little Tallahatchie River in Mississippi, and 7.5 MW at the Wappapello project on the St. Francis River, Missouri. Beyond these potential additions the recognized potential for interregional development of new hydropower projects is limited to only three sites - Benton, Saline River, Arkansas; Rowland Church, St. Francis River, Missouri; and Youngton, Black River, Mississippi. The potential output of these projects is summarized in table 118, which gives a WRPA breakdown of the region's existing and potential hydroelectric power projects.

In view of the current energy crisis and the uncertainty of future energy requirements, the potential marketable additions to the Carpenter, Remmel, DeGray, Sardis, and Wappapello projects are included as 1980 components of the hydropower plan for the National Income Objective. In doing so, it is recognized that this may be a somewhat unrealistic timeframe for planning and developing these additions. The Rowland Church, Benton, and Youngton projects are included as plan components for the year 2000. The Youngton project is included with no apparent economic justification at this time. Future conditions regarding the criticality of need for electric power may require analysis of hydropower development using a criterion other than the benefit-cost analysis. Thus, the Youngton project, as well as the other projects proposed for 2000, could be considered for earlier development.

No meaningful assessment of the effectiveness of the region's hydroelectric power development in meeting future needs could be made because of the complex interrelationship between all power sources and marketing procedures in the power market area of which the Lower Mississippi Region is only a part.

Table 117 - Potential Hydroelectric Projects in Power Market Area with Output Marketable in Lower Mississippi Region1/

Project	Stream	State	Dependable Capacity (MW)
Conventional - by 1980			
Wolf Bayou	White R.	Arkansas	180
Kaw	Arkansas R.	Oklahoma	25
Total			205
Pumped Storage - by 1980			
Optimus	White R.	Arkansas	500
Petit Jean	Arkansas R.	Arkansas	561
Tuskahoma	Kiamichi R.	Oklahoma	1,000
Total			2,061
Conventional - by 1990			
Grandview	Kings R.	Arkansas	18
Galena	James R.	Missouri	43
Bell Foley	Strawberry R.	Arkansas	24
Gainesville	Red R.	Oklahoma	50
Dougherty	Washita R.	Oklahoma	25
Durwood	Washita R.	Oklahoma	20
Denison	Red R.	Oklahoma	52
Tuskahoma	Kiamichi R.	Oklahoma	19
Upper Antlers	Kiamichi R.	Oklahoma	90
Buck Creek	Kiamichi R.	Oklahoma	12
Hugo	Kiamichi R.	Oklahoma	50
Pine Creek	Little R.	Oklahoma	86
Lukfata	Glover Cr.	Oklahoma	35
Sherwood	Mountain Fork	Oklahoma	103
Hartley	Cossatot R.	Arkansas	14
Carthage	Sabine R.	Texas	16
State Line	Sabine R.	La.-Tex.	134
Bon Wier	Sabine R.	La.-Tex.	20
Total			811
Pumped Storage - by 1990			
Mulladay	White R.	Arkansas	485
Boktukola	Mountain Fork	Oklahoma	1,000
Sherwood	Mountain Fork	Oklahoma	500
Total			1,985

1/ Projects located outside boundary of Lower Mississippi Region.

Table 118- Summary of Existing and Potential Hydroelectric Projects, Lower Mississippi Region

WRPA	Project	Stream	State	Existing Capacity Installed (MW)	Existing Capacity Dependable (MW)	Minimum Annual Energy (GWh)	Potential Additional Capacity (MW)	Total Capacity (MW)
1	None			0.0	0.0	0.0	0.0	0.0
2	Rowland Church	St. Francis River	Mo.	0.0	0.0	0.0	70.6	70.6
	Wappapello	St. Francis River	Mo.	0.0	0.0	0.0	7.5	7.5
3	None			0.0	0.0	0.0	0.0	0.0
4	Sardis	Little Tallahatchie R.	Miss.	0.0	0.0	0.0	18.0	18.0
5	Benton	Saline R.	Ark.	0	0	0	50.0	50.0
	Blakely Mountain	Ouachita R.	Ark.	75.0	75.0	139.2	0.0	75.0
	Carpenter	Ouachita R.	Ark.	56.0	56.0	76.6	28.0	84.0
	DeGray	Caddo R.	Ark.	0.0	0.0	0.0	108.0	108.0
	Narrows	Little Mo. R.	Ark.	25.5	21.0	18.4	0.0	25.5
	Remmel	Ouachita R.	Ark.	9.3	10.0	43.0	6.6	15.9
6	None			0.0	0.0	0.0	0.0	0.0
7	Youngton	Big Black R.	Miss.	0.0	0.0	0.0	80.0	80.0
8	None			0.0	0.0	0.0	0.0	0.0
9	None			0.0	0.0	0.0	0.0	0.0
10	None			0.0	0.0	0.0	0.0	0.0
LMR				165.8	162.0	277.2	368.7	534.5

Other Program A Components

As stated in the introduction to this section, detailed discussion of program components for satisfaction of the expressed needs in the coastal and estuarine zone and for archeological and historical resources and health aspects is included only in the section covering the recommended program since program components in these areas are identical for all programs. Table 119 summarizes plans for these categories to complete the National Income Program. Environmental aspects of these plans are discussed under the Recommended Program.

Need for Additional Studies

The need for additional studies is identical for all programs and is discussed in detail in a section following the recommended framework program (pages 457 to 476).

Summary of the National Income Program

Table 120 is a summary of Program A. It gives a consolidation of outputs from the plans previously discussed in detail. Units are given incrementally for the time spans: present to 1980, 1981-2000, and 2001-2020; 50-year totals are given for each subarea and the region. Program components cover the entire spectrum - from works already authorized to long range studies or research where serious data deficiencies exist.

While no specific program measures (such as purchase or control of lands to insure agricultural use) are included for meeting projected food and fiber needs on the region's forest lands, croplands, and grazing lands, the program allocates sufficient lands to allow satisfaction of these needs. Specific action components of the program involve public investments and are directed toward satisfying, in the most economical manner possible, the region's water supply needs and food and fiber needs; toward solving as many as possible of the region's flood control, agricultural land drainage, irrigation, land treatment, water quality, navigation, health aspects, coastal and estuarine, and archeological and historical problems and needs; and toward satisfying as many as possible of the region's needs for recreation, fish and wildlife, and natural environmental quality. Additional studies are also an important part of the program. A detailed discussion of this need which is identical for all programs can be found in the major section entitled "Data Deficiencies and Need for Additional Studies." The program places primary emphasis on the National Income criterion but is also responsive to regional development and environmental quality considerations.

Program Costs

General

In table 121, estimated costs for the National Income Program are summarized by major program features, categories of resource use, and

Table 119-Other Program A Component Plans, Lower Mississippi Region

Plan

Coastal and Estuarine

WRPA	Timeframe	Measure[1]	Purpose	Amount[2]
9	2000	Construct 10 low flow weirs	Water level management and land building	89,800 c.f.s.
	2020	1 control structure and 1 navigation lock	Salinity Control	13,800 c.f.s.[3]
10	1980	Bank Stabilization works, 1 control structure, 10 miles of levee, 5 miles of channel	Shoreline erosion control, salinity control and land building	1,500 c.f.s. & 10.1 miles
	2000	3 control structures, 50 miles of levee & 25 miles of channel	Salinity control and land building	6,800 c.f.s.
	2020	42 miles of channel, modification of spillway gates, 4 control structures & 70 miles of levee	Salinity control and land building	172,600 c.f.s.

Total Mississippi River Flow Required - 1,500 c.f.s. in 1980, 96,600 c.f.s. in 2000, and 172,600 c.f.s. in 2020.

Health Aspects

WRPA	State	Time Frame		Purpose	Number[4]
2, 5, & 6	Arkansas	1980	State Drinking Water Program	The purpose of all Health Aspects measures is for the protection of the public's health and general welfare.	1
			Vector Abatement Districts		9
		2000	Vector Abatement Districts		16
3	Kentucky	1980	State Drinking Water Program		1
5, 6, 8, 9 & 10	Louisiana	1980	State Drinking Water Program		1
			Vector Abatement Districts		30
		2000	Vector Abatement Districts		32
4, 7, & 8	Mississippi	1980	State Drinking Water Program		1
			Vector Abatement Districts		10
		2000	Vector Abatement Districts		16
2	Missouri	1980	State Drinking Water Program		1
3	Tennessee	1980	State Drinking Water Program		1
			Vector Abatement Districts		1
		2000	Vector Abatement Districts		3
LMR		1980	State Drinking Water Programs		6
			Vector Abatement Districts		50
		2000	Vector Abatement Districts		67

1/ Description of these measures, designated to enhance the estuarine environment, is given on pages 428 through 439.
2/ As explained later, all coastal and estuarine needs except shoreline protection can best be expressed in terms of Mississippi River flow.
3/ An equivalent flow - the control structure and navigation lock will provide salinity control.
4/ Cumulative by time period.

Table 119 - Other Program A Component Plans, Lower Mississippi Region (Cont'd)

Plan

Archeology

WRPA	Intensive Surveys To Be Complete by 1980	Number of Sites To Be tested 1980	Number of Sites To Be tested 2000 5/	Number of Sites To Be Excavated 1980	Number of Sites To Be Excavated 2000 5/
2	8	74	322	18	76
3	5	45	201	10	45
4	7	61	261	14	58
5	10	90	390	21	90
6	2	20	81	4	18
7	3	28	120	6	27
8	3	27	121	6	28
9	6	54	234	12	54
10	3	27	118	6	29
LMR	48	426	1,848	97	425

History 6/

	Resources To Be Added To Federal or State Register									Structure Restoration			Roads & Trails			Cemeteries			Interpretive Markers		
	Structures			Districts			Sites														
WRPA	1980	2000	2020	1980	2000	2020	1980	2000	2020	1980	2000	2020	1980	2000	2020	1980	2000	2020	1980	2000	2020
2	140	270	345	3	4	3	102	122	142	35	90	115	8	7	6	1	1	2	35	50	50
3	1,115	403	722	9	11	16	80	33	27	45	70	90	3	16	4	45	65	58	82	145	152
4	35	100	220	2	2	1	50	12	2	12	45	100	4	2	0	20	75	20	10	50	150
5	150	250	325	4	2	2	151	174	152	75	131	154	3	3	4	0	2	0	80	190	300
6	38	51	32	1	1	0	11	16	26	21	10	15	0	1	2	0	1	1	34	124	204
7	100	100	100	4	10	25	50	20	15	20	10	15	5	7	10	50	75	30	25	50	75
8	55	110	88	2	4	6	8	19	5	28	56	58	3	4	3	6	13	12	35	140	235
9	70	100	200	2	4	2	0	0	0	15	32	23	0	2	1	2	2	0	30	130	230
10	300	2,900	1,075	1	2	2	2	0	0	268	2,730	4,200	0	2	1	1	2	0	36	156	276
LMR	2,003	4,284	3,107	28	40	57	454	396	369	519	3,174	4,770	26	44	31	125	236	183	367	1,035	1,672

5/ Includes those in previous time period.
6/ In addition to the needs shown, there is a need to complete a comprehensive regionwide historic survey by 1980.

Table 120 - Program A Composition, *Lower Mississippi Region*

Planning Area & Time Frame	Water Supply (mgd) Municipal	Water Supply (mgd) Fish & Wildlife	Water Supply (mgd) Total	Water Surface Area Recreation (1,000 Acres)	Water Surface Area Fish & Wildlife (Miles)1/	Natural Environment (1,000 Acres)	Land (1,000 Acres) Recreation4/	Land (1,000 Acres) Fish & Wildlife	Land (1,000 Acres) Natural Environment	Land (1,000 Acres) Total
WRPA 1										
1970-1980	0.0	0.0	0.0	0.0	3/	4.0	0.0	0.0	6.0	6.0
1980-2000	0.0	0.0	0.0	0.0	3/	0.0	0.0	0.0	0.0	0.0
2000-2020	0.0	0.0	0.0	0.0	3/	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	3/	4.0	0.0	0.0	6.0	6.0
WRPA 2										
1970-1980	5.3	50.0	186.5 2/	0.0	1203.0	15.0	2.0	104.0	26.1	297.4
1980-2000	16.5	110.0	155.3 2/	3.0	0.0	0.0	1.4	63.6	0.0	65.0
2000-2020	26.0	110.0	136.0 2/	45.0	0.0	0.0	9.6	90.7	0.0	100.3
Total	47.8	270.0	475.8 2/	48.0	1203.0	15.0	13.0	258.3	26.1	297.4
WRPA 3										
1970-1980	33.9	43.0	76.9	139.0	822.0	7.0	30.0	56.2	53.7 5/	139.9
1980-2000	102.4	86.0	188.4	185.0	0.0	0.0	28.1	38.1	0.0	66.2
2000-2020	130.7	86.0	216.7	173.0	0.0	0.0	43.3	54.3	0.0	97.6
Total	267.0	215.0	482.0	497.0	822.0	7.0	101.4	148.6	53.7	303.7
WRPA 4										
1970-1980	11.9	22.0	33.9	8.0	1100.0	3.0	7.3	92.2	13.4	112.9
1980-2000	24.1	30.0	54.1	67.0	0.0	0.0	9.8	43.0	0.0	52.8
2000-2020	33.9	34.0	67.9	38.0	0.0	0.0	20.2	61.3	0.0	81.5
Total	69.9	86.0	155.9	113.0	1100.0	3.0	37.3	196.5	13.4	247.2
WRPA 5										
1970-1980	11.6	31.0	42.6	0.0	1931.0	4.0	9.5	103.5	32.0 5/	145.0
11980-2000	23.9	60.0	83.9	0.0	0.0	0.0	15.7	60.4	0.0	76.1
2000-2020	44.0	62.0	106.0	60.0	0.0	0.0	27.4	86.2	0.0	113.6
Total	79.5	153.0	232.5	60.0	1931.0	4.0	52.6	250.1	32.0	334.7
WRPA 6										
1970-1980	1.0	8.0	9.0	0.0	536.0	1.0	3.7	25.0	2.9 5/	31.6
1980-2000	2.3	16.0	18.3	2.0	0.0	0.0	1.3	11.7	0.0	13.0
2000-2020	3.3	17.0	20.3	10.0	0.0	0.0	2.0	16.7	0.0	18.7
Total	6.6	41.0	47.6	12.0	536.0	1.0	7.0	53.4	2.9	63.3
WRPA 7										
1970-1980	3.3	2.0	5.3	0.0	450.0	4.0	3.2	30.0	24.9 5/	58.1
1980-2000	6.8	6.0	12.8	0.0	0.0	0.0	1.9	17.4	0.0	19.3
2000-2020	10.7	5.0	15.7	0.0	0.0	0.0	3.0	24.7	0.0	27.7
Total	20.8	13.0	33.8	0.0	450.0	4.0	8.1	72.1	24.9	105.1
WRPA 8										
1970-1980	16.9	2.0	18.9	0.0	400.0	2.0	14.7	14.0	19.7 5/	48.4
1980-2000	36.5	3.0	39.5	0.0	0.0	0.0	10.1	3.2	0.0	13.3
2000-2020	48.9	4.0	52.9	36.0	0.0	0.0	15.8	4.5	0.0	20.3
Total	102.3	9.0	111.3	36.0	400.0	2.0	40.6	21.7	19.7	82.0
WRPA 9										
1970-1980	20.0	73.0	93.0	0.0	928.0	1.0	17.6	27.0	17.3 5/	61.9
1980-2000	34.2	188.0	424.2 2/	0.0	0.0	0.0	8.8	119.7	0.0	128.5
2000-2020	41.5	120.0	425.5 2/	0.0	0.0	0.0	12.4	170.8	0.0	183.2
Total	95.7	381.0	942.7 2/	0.0	928.0	1.0	38.8	317.5	17.3	373.6
WRPA-10										
1970-1980	35.6	0.0	35.6	0.0	329.0	0.0	37.5	11.0	24.0 5/	72.5
1980-2000	89.8	2.0	91.8	0.0	0.0	0.0	23.9	32.8	0.0	56.7
2000-2020	118.1	1.0	119.1	0.0	0.0	0.0	37.0	46.7	0.0	83.7
Total	243.5	3.0	247.0	0.0	329.0	0.0	98.4	90.5	24.0	212.9
Region										
1970-1980	139.5	231.0	501.7 2/	147.0	7699.0	41.0	125.5	463.9	220.0	809.4
1980-2000	336.5	501.0	1066.3 2/	257.0	0.0	0.0	101.0	389.9	0.0	490.9
2000-2020	457.1	439.0	1160.1 2/	362.0	0.0	0.0	170.7	561.9	0.0	732.6
Total	933.1	1171.0	2728.1 2/	766.0	7699.0	41.0	397.2	1415.7	220.0	2032.9

1/ Stream miles.
2/ Includes irrigation withdrawals.
3/ The main stem of the Mississippi River is not considered quality stream fishing in the fish and wildlife context involved here. However, access is provided (though no mileage is given) and costs are included in the program (shared equally by recreation) for this access which will make the Mississippi River available to residents of adjoining WRPA's for limited fishing and recreation activities.

4/ Overlaps Natural Environmental Quality acreage in some WRPA's. Double counting has been eliminated in cost tables.
5/ Provides all or part of Class A recreation lands for 2000 and 2020.

Table 120 - Program A Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Land Treatment[6/] (1000 Acres)	Sediment and Erosion Control: Streambanks (Miles)	Sediment and Erosion Control: Roadbanks (Miles)	Sediment and Erosion Control: Total (Miles)	Drainage: Watershed Management (1000 Acres)	Drainage: Channels (Miles)	Municipal Water Quality Control: Secondary Treatment (1000 lb. BOD_5)	Municipal Water Quality Control: Advance Treatment (1000 lb. BOD_5)	Municipal Water Quality Control: Other[7/] (1000 lb. BOD_5)	Municipal Water Quality Control: Bacteria Control[8/] (mgd)
WRPA 1										
1970-1980	0	0	0	0	0	0	0	0	0	0
1980-2000	0	0	0	0	0	0	0	0	0	0
2000-2020	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
WRPA 2										
1970-1980	3256.5	128	441	569	474.3	4930.0	14.0	0	5.0	39.9
1980-2000	3597.6	49	386	435	948.4	5080.0	0	38.0	1.0	16.6
2000-2020	4023.7	36	275	311	948.5	5120.0	0	69.0	2.0	26.3
Total	10,877.8	213	1102	1315	2371.2	15,130.0	-	-	-	82.8
WRPA 3										
1970-1980	2512.3	369	554	923	16.1	140.0	140.0	0	19.0	113.8
1980-2000	2613.5	222	485	707	32.2	240.0	0	249.0	0	75.7
2000-2020	2726.8	152	346	498	32.3	230.0	0	362.0	7.0	91.4
Total	7852.6	743	1385	2128	80.6	610.0	-	-	-	280.9
WRPA 4										
1970-1980	3354.1	266	806	1072	294.9	4040.0	25.0	0	5.0	45.6
1980-2000	3697.5	191	705	896	589.8	3130.0	0	47.0	1.0	17.8
2000-2020	3838.5	143	503	646	589.8	3100.0	0	72.0	2.0	25.4
Total	10,890.1	600	2014	2614	1474.5	10,270.0	-	-	-	88.8
WRPA 5										
1970-1980	3385.8	76	1174	1250	114.6	910.0	26.0	0	7.0	24.8
1980-2000	3612.0	50	1028	1078	229.1	1310.0	0	60.0	2.0	14.3
2000-2020	4073.3	35	734	769	229.1	1370.0	0	98.0	2.0	24.9
Total	11,071.1	161	2936	3097	572.8	3590.0	-	-	-	64.0
WRPA 6										
1970-1980	1259.3	42	165	207	131.7	1460.0	6.0	0	2.0	2.1
1980-2000	1410.2	37	145	182	263.4	1560.0	0	9.0	1.0	1.2
2000-2020	1530.2	28	103	131	263.4	1350.0	0	12.0	1.0	1.7
Total	4199.7	107	413	520	658.5	4370.0	-	-	-	5.0
WRPA 7										
1970-1980	1261.9	106	524	630	21.4	410.0	5.0	0	1.0	6.1
1980-2000	1236.1	67	458	525	42.8	250.0	0	9.0	0	2.8
2000-2020	1406.4	44	327	371	42.8	230.0	0	13.0	1.0	4.4
Total	3904.4	217	1309	1526	107.0	890.0	-	-	-	13.3
WRPA 8										
1970-1980	851.9	40	232	272	20.8	540.0	29.0	0	6.0	20.4
1980-2000	798.7	24	203	227	41.6	390.0	0	59.0	2.0	23.9
2000-2020	871.5	16	145	161	41.6	230.0	0	89.0	3.0	32.0
Total	2522.1	80	580	660	104.0	1160.0	-	-	-	76.3
WRPA 9										
1970-1980	1857.9	8	599	607	196.8	2210.0	40.0	0	10.0	32.4
1980-2000	2091.5	3	524	527	393.5	2240.0	0	72.0	5.0	29.2
2000-2020	2213.6	4	374	378	393.6	2000.0	0	100.0	4.0	37.4
Total	6163.0	15	1497	1,512	983.9	6450.0	-	-	-	99.0
WRPA 10										
1970-1980	670.0	2	38	40	25.8	430.0	109.0	0	21.0	74.1
1980-2000	631.1	1	33	34	51.7	420.0	0	204.0	6.0	63.9
2000-2020	544.0	1	23	24	51.6	290.0	0	297.0	8.0	77.3
Total	1845.1	4	94	98	129.1	1140.0	-	-	-	215.3
Region										
1970-1980	18,409.7	1,037	4533	5,570	1296.4	15,070.0	394.0	0	76.0	359.2
1980-2000	19,688.2	644	3967	4,611	2592.5	14,620.0	0	747.0	21.0	245.4
2000-2020	21,228.0	459	2830	3,289	2592.7	13,920.0	0	1112.0	30.0	320.8
Total	59,325.9	2,140	11,330	13,470	6481.6	43,610.0	-	-	-	925.4

6/ Includes land treatment to reduce flood runoff and critical area treatment to reduce sediment and erosion.
7/ Includes mechanical reaeration and stream assimilation.
8/ Chlorination.

Table 120 - Program A Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	FLOOD CONTROL: Principal Reaches: Levees (Miles)	Principal Reaches: Channels (Miles)	Principal Reaches: Reservoirs: Number	Principal Reaches: Reservoirs: Storage (1000 Acre-Ft.)	Principal Reaches: Pumping Plants (Number)	Upstream Watersheds: Channels (Miles)	Upstream Watersheds: Retarding Dams: Number	Upstream Watersheds: Retarding Dams: Storage (1000 Acre-Ft.)	Upstream Watersheds: Floodplain Management (1000 Acres)	Upstream Watersheds: Watershed Management (1000 Acres)
WRPA 1										
1970-1980	0	0	0	0	0	0	0	0	0	0
1980-2000	0	0	0	0	0	0	0	0	0	0
2000-2020	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
WRPA 2										
1970-1980	5.9	641.6	0	0	5	4,878	268	149	2,236	8,034
1980-2000	9.7	618.0	0	0	3	130	0	0	87	291
2000-2020	0	340.0	0	0	0	95	5	11	92	411
Total	15.6	1599.6	0	0	8	5,103	273	160	2,415	8,736
WRPA 3										
1970-1980	7.7	292.0	1	18	7	660	201	244	293	1,929
1980-2000	169.2	51.7	0	0	2	454	120	134	111	918
2000-2020	0	96.9	0	0	0	269	92	99	115	668
Total	176.9	440.6	1	18	9	1,383	413	477	519	3,515
WRPA 4										
1970-1980	359.4	928.3	0	0	1	3,674	53	42	1,370	4,737
1980-2000	76.6	208.1	0	0	9	18	16	18	24	131
2000-2020	82.5	605.0	0	0	9	1,146	12	11	305	970
Total	518.5	1741.4	0	0	19	4,838	81	71	1,699	5,838
WRPA 5										
1970-1980	152.9	69.0	11	450	3	389	116	209	664	1,730
1980-2000	188.7	242.9	1	80	6	146	2	15	87	162
2000-2020	2.0	62.0	0	0	1	301	50	101	504	1,283
Total	343.6	373.9	12	530	10	836	168	325	1,255	3,175
WRPA 6										
1970-1980	0	266.7	0	0	1	2,026	0	0	1,465	1,876
1980-2000	1.5	159.6	0	0	1	325	0	0	111	317
2000-2020	0	105.0	0	0	0	0	0	0	0	0
Total	1.5	531.3	0	0	2	2,351	0	0	1,576	2,193
WRPA 7										
1970-1980	12.4	12.0	0	0	1	1,157	284	423	348	2,690
1980-2000	7.0	0	0	0	2	163	94	142	60	1,018
2000-2020	6.0	0	0	0	0	0	0	0	0	0
Total	25.4	12.0	0	0	3	1,320	378	565	408	3,708
WRPA 8										
1970-1980	0	6.0	0	0	0	983	55	104	734	1,505
1980-2000	0	3.0	0	0	0	368	98	169	219	1,225
2000-2020	10.5	3.0	0	0	2	0	12	37	17	443
Total	10.5	12.0	0	0	2	1,351	165	310	970	3,173
WRPA 9										
1970-1980	13.5	163.0	0	0	0	2,875	0	0	1,810	3,025
1980-2000	13.9	0	0	0	0	511	0	0	469	797
2000-2020	62.0	0	0	0	0	0	0	0	0	0
Total	89.4	163.0	0	0	0	3,386	0	0	2,279	3,822
WRPA 10										
1970-1980	20.0	0	0	0	5	505	0	0	337	669
1980-2000	61.6	0	0	0	17	344	3	13	335	530
2000-2020	44.0	0	0	0	3	40	0	0	42	42
Total	125.6	0	0	0	25	889	3	13	714	1,241
Region										
1970-1980	571.8	2378.6	12	468	22	17,147	977	1,171	9,258	26,196
1980-2000	528.2	1283.3	1	80	40	2,459	333	491	1,502	5,389
2000-2020	207.0	1211.9	0	0	15	1,851	171	259	1,074	3,819
Total	1307.0	4873.8	13	548	77	21,457	1,481	1,921	11,834	35,404

Table 120 - Program A Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Navigation Facilities: Channels (Miles): Deep Draft	Shallow Draft	Total	Harbors (Number)	Locks (Number)	Hydropower Production (MW)	Coastal & Estuarine	Archeological & Historical	Public Health
WRPA 1									
1970-1980	288.0	0	288.0	0	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	288.0	0	288.0	0	0	0	0	9/	10/
WRPA 2									
1970-1980	0	200.0	200.0	2	0	7.5	0	9/	10/
1980-2000	0	0	0	6	0	70.6	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	200.0	200.0	9	0	78.1	0	9/	10/
WRPA 3									
1970-1980	0	0	0	1	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	2	0	0	0	9/	10/
WRPA 4									
1970-1980	0	0	0	7	1	18.0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	10	1	18.0	0	9/	10/
WRPA 5									
1970-1980	0	0	0	5	2	40.0	0	9/	10/
1980-2000	0	0	0	2	0	50.0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	9	2	90.0	0	9/	10/
WRPA 6									
1970-1980	0	0	0	3	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	0	0	4	0	0	0	9/	10/
WRPA 7									
1970-1980	0	0	0	0	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	1	0	0	0	9/	10/
WRPA 8									
1970-1980	0	0	0	0	0	0	11/	9/	10/
1980-2000	0	0	0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	1	0	11/	9/	10/
Total	0	0	0	0	3	0	11/	9/	10/
WRPA 9									
1970-1980	6.5	84.0	90.5	0	2	0	11/	9/	10/
1980-2000	34.0	270.0	304.0	0	2	0	11/	9/	10/
2000-2020	200.0	0	200.0	0	0	0	11/	9/	10/
Total	240.5	354.0	594.5	0	4	0	11/	9/	10/
WRPA 10									
1970-1980	50.0	97.0	147.0	0	1	0	11/	9/	19/
1980-2000	0	188.0	188.0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	3	0	11/	9/	10/
Total	50.0	285.0	335.0	0	6	0	11/	9/	10/
Region									
1970-1980	344.5	381.0	725.5	18	6	65.5	11/	9/	10/
1980-2000	34.0	458.0	492.0	11	6	120.6	11/	9/	10/
2000-2020	200.0	0	200.0	6	4	0	11/	9/	10/
Total	578.5	839.0	1417.5	35	16	186.1	11/	9/	10/

9/ Composed of surveying, testing and excavating archeological sites, and preservation, restoration and maintenance of historic resources. See Recommended Program Composition (table 154).
10/ Composed of public drinking water programs and vector abatement districts at state level. See Recommended Program Composition (table 154).
11/ Composed of measures for salinity control, shoreline erosion control, and water level management. See Recommended Program Composition (table 154).

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000)

	REGIONAL SUMMARY											
	1971-1980						1980-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	19,834	19,832	620	11,955	39,666	12,575	126,626	54,204	3,512	25,854	180,830	29,366
Municipal	(16,577)	(16,576)	(0)	(11,336)	(33,153)	(11,336)	(44,707)	(44,707)	(0)	(20,706)	(89,414)	(20,706)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(75,286)	(2,864)	(1,968)	(3,604)	(78,150)	(5,572)
Fish and Wildlife	(3,257)	(3,256)	(620)	(619)	(6,513)	(1,239)	(6,633)	(6,633)	(1,544)	(1,544)	(13,266)	(3,088)
Water Surface	385,849	168,215	0	4,779	554,064	4,779	326,614	148,012	0	8,110	474,626	8,110
Recreation												
Small Water	(139,884)	(139,883)	(0)	(2,082)	(279,767)	(2,082)	(147,093)	(147,093)	(0)	(4,216)	(294,186)	(4,216)
Large Water	(231,699)	(14,067)	(0)	(1,084)	(245,766)	(1,084)	(178,600)	(0)	(0)	(2,098)	(178,600)	(2,098)
Stream Access	(2,075)	(2,075)	(0)	(457)	(4,150)	(457)	(413)	(412)	(0)	(538)	(825)	(538)
Fish and Wildlife	(5,050)	(5,050)	(0)	(1,010)	(10,100)	(1,010)	(508)	(507)	(0)	(1,112)	(1,015)	(1,112)
Natural Environment	(7,141)	(7,140)	(0)	(146)	(14,281)	(146)	(0)	(0)	(0)	(146)	(0)	(146)
Lands	608,825	2,905,836	46,753	48,827	3,514,661	95,580	361,008	361,007	85,398	89,032	722,015	174,430
Recreation	(463,800)	(463,800)	(46,743)	(46,742)	(927,600)	(93,485)	(292,775)	(292,775)	(85,388)	(85,387)	(585,550)	(170,775)
Fish and Wildlife	(132,455)	(14,717)	(0)	(1,932)	(147,172)	(1,932)	(68,233)	(68,232)	(0)	(3,492)	(136,465)	(3,492)
Natural Environment	(12,570)	(2,427,319)	(10)	(153)	(2,439,889)	(163)	(0)	(0)	(10)	(153)	(0)	(163)
Flood Control & Related Problems	1,049,108	597,224	3,805	12,583	1,646,332	16,529	520,270	590,602	6,763	26,013	1,110,872	32,920
Flood Control												
Principal Reaches	(530,348)	(33,454)	(3,253)	(620)	(563,802)	(4,014)	(313,214)	(42,044)	(5,153)	(900)	(355,258)	(6,053)
Upstream	(292,444)	(76,891)	(0)	(4,568)	(369,335)	(4,568)	(93,583)	(22,917)	(0)	(5,313)	(116,500)	(5,313)
Land Treatment	(31,890)	(419,794)	(0)	(0)	(451,684)	(0)	(36,354)	(459,100)	(0)	(0)	(495,454)	(0)
Sediment and Erosion												
Critical Land Treatment	(34,797)	(17,301)	(0)	(0)	(52,098)	(0)	(17,622)	(8,761)	(0)	(0)	(26,383)	(0)
Streambank	(42,043)	(300)	(552)	(1,503)	(42,343)	(2,055)	(41,797)	(179)	(1,610)	(2,403)	(41,976)	(4,013)
Roadbanks	(1,842)	(991)	(0)	(85)	(2,833)	(85)	(1,611)	(868)	(0)	(159)	(2,479)	(159)
Drainage												
Watershed Management	(1,043)	(19,818)	(0)	(4,173)	(20,861)	(4,173)	(2,811)	(53,413)	(0)	(15,417)	(56,224)	(15,417)
Channels	(114,701)	(28,675)	(0)	(1,634)	(143,376)	(1,634)	(13,278)	(3,320)	(0)	(1,824)	(16,598)	(1,824)
Water Quality and Pollution	171,819	72,898	0	3,233	244,717	3,233	452,836	153,744	0	3,734	606,580	3,734
Municipal Waste Treatment	(171,819)	(57,273)	(0)	(475)	(229,092)	(475)	(452,836)	(150,945)	(0)	(462)	(603,781)	(462)
Bacteria Control	(0)	(15,625)	(0)	(2,758)	(15,625)	(2,758)	(0)	(2,799)	(0)	(3,272)	(2,799)	(3,272)
Navigation	614,529	98,461	13,698	111	712,990	13,809	147,879	32,437	17,313	181	180,316	17,494
Hydropower	19,189	0	254	0	19,189	254	121,055	0	1,807	0	121,055	1,807
Coastal and Estuarine	3,900	1,900	0	36	5,800	36	10,500	10,500	0	166	21,000	166
Historical and Archeological	19,143	19,147	0	0	38,295	0	63,478	63,478	0	0	126,956	0
Health	0	0	0	5,402	0	5,402	0	0	0	9,336	0	9,336
TOTALS	2,829,201	3,883,513	65,130	86,926	6,775,714	152,137	2,130,266	1,413,984	114,793	162,429	3,544,250	277,363

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) (Cont'd)

REGIONAL SUMMARY (Cont'd)

Feature	2001-2020 Investment Federal	2001-2020 Investment Non-Federal	2001-2020 Annual O&M Federal	2001-2020 Annual O&M Non-Federal	2001-2020 Totals Investment	2001-2020 Totals O&M	Total Program Investment Cost ($1,000) Federal	Total Program Investment Cost ($1,000) Non-Federal	Total Program Investment Cost ($1,000) Total
Water Supply	112,205	86,071	4,201	41,455	198,276	45,656	258,665	160,107	418,772
Municipal	(76,324)	(76,325)	(0)	(33,480)	(152,649)	(33,480)	(137,608)	(13,608)	(275,216)
Irrigation	(26,268)	(132)	(1,968)	(5,743)	(26,400)	(7,711)	(101,554)	(2,996)	(104,550)
Fish and Wildlife	(9,613)	(9,614)	(2,233)	(2,232)	(19,227)	(4,465)	(19,503)	(19,503)	(39,006)
Water Surface	253,941	253,941	0	12,122	507,882	12,122	966,404	570,169	1,536,573
Recreation									
Small Water	(253,021)	(253,021)	(0)	(8,044)	(506,042)	(8,044)	(539,998)	(539,997)	(1,079,995)
Large Water	(0)	(0)	(0)	(2,098)	(0)	(2,098)	(410,299)	(14,067)	(424,366)
Stream Access	(375)	(375)	(0)	(613)	(750)	(613)	(2,863)	(2,862)	(5,725)
Fish and Wildlife	(545)	(545)	(0)	(1,221)	(1,090)	(1,221)	(6,103)	(6,102)	(12,205)
Natural Environment	(0)	(0)	(0)	(146)	(0)	(146)	(7,141)	(7,141)	(14,282)
Lands	653,157	653,158	154,150	160,009	1,306,315	314,159	1,622,990	3,920,001	5,542,991
Recreation	(555,875)	(555,875)	(154,140)	(154,140)	(1,111,750)	(308,280)	(1,312,450)	(1,312,450)	(2,624,900)
Fish and Wildlife	(97,282)	(97,283)	(0)	(5,716)	(194,565)	(5,716)	(297,970)	(180,232)	(478,202)
Natural Environment	(0)	(0)	(10)	(153)	(0)	(163)	(12,570)	(2,427,319)	(2,439,889)
Flood Control & Related Problems	288,539	607,815	8,921	43,020	896,356	52,084	1,857,917	1,795,641	3,653,560
Flood Control									
Principal Reaches	(137,839)	(12,128)	(6,256)	(960)	(149,967)	(7,216)	(981,401)	(87,626)	(1,069,027)
Upstream	(55,215)	(13,347)	(0)	(5,770)	(68,562)	(5,770)	(441,242)	(113,155)	(554,397)
Land Treatment	(41,756)	(501,886)	(0)	(0)	(543,642)	(0)	(110,000)	(1,380,780)	(1,490,780)
Sediment and Erosion									
Critical Land Treatment	(6,839)	(3,407)	(0)	(0)	(10,246)	(0)	(59,258)	(29,469)	(88,727)
Streambank	(35,853)	(120)	(2,665)	(3,000)	(35,925)	(5,665)	(119,693)	(599)	(120,294)
Roadbanks	(1,150)	(619)	(0)	(212)	(1,769)	(212)	(4,603)	(2,478)	(7,081)
Drainage									
Watershed Management	(3,938)	(74,821)	(0)	(31,169)	(78,759)	(31,169)	(7,792)	(148,052)	(155,844)
Channels	(5,949)	(1,487)	(0)	(1,909)	(7,436)	(1,909)	(133,928)	(33,482)	(167,410)
Water Quality and Pollution	303,554	105,019	0	4,407	408,573	4,407	928,209	331,661	1,259,870
Municipal Waste Treatment	(303,554)	(101,185)	(0)	(562)	(404,739)	(562)	(928,209)	(309,403)	(1,237,612)
Bacteria Control	(0)	(3,834)	(0)	(3,845)	(3,834)	(3,845)	(0)	(22,258)	(22,258)
Navigation	564,625	167,360	22,877	182	731,985	23,059	1,327,032	298,258	1,625,290
Hydropower	0	0	1,807	0	0	1,807	140,244	0	140,244
Coastal and Estuarine	120,000	120,000	0	1,716	240,000	1,716	134,400	132,400	266,800
Historical and Archeological	22,800	22,790	0	0	45,590	0	105,426	105,415	210,841
Health	0	0	0	11,723	0	11,723	0	0	0
TOTALS	2,318,821	2,016,154	191,956	274,634	4,334,977	466,590	7,341,287	7,313,652	14,654,940

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) (Cont'd)

WRPA 1

Feature	1971-1980 Investment Federal	Investment Non-Federal	Annual O&M Federal	Annual O&M Non-Federal	Totals Investment	Totals O&M	1981-2000 Investment Federal	Investment Non-Federal	Annual O&M Federal	Annual O&M Non-Federal	Totals Investment	Totals O&M
Lands												
Natural Environment	749	748	0	6	1,497	6	0	0	0	6	0	6
Navigation												
Deep Draft Channels	27,000	9,000	7,000	0	36,000	7,000	0	0	7,000	0	0	7,000
Historical & Archeological	111	111	0	0	222	0	809	809	0	0	1,618	0
Health	0	0	0	12	0	12	0	0	0	27	0	27
TOTALS	27,860	9,859	7,000	18	37,719	7,018	809	809	7,000	33	1,618	7,033

Feature	2001-2020 Investment Federal	Investment Non-Federal	Annual O&M Federal	Annual O&M Non-Federal	Totals Investment	Totals O&M	Total Investment Costs ($1,000) Federal	Non-Federal	Total
Lands									
Natural Environment	0	0	0	6	0	6	749	748	1,497
Navigation									
Deep Draft Channels	0	0	7,000	0	0	7,000	27,000	9,000	36,000
Historical & Archeological	0	0	0	0	0	0	920	920	1,840
Health	0	0	0	55	0	55	0	0	0
TOTALS	0	0	7,000	61	0	7,061	28,669	10,668	39,337

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) (Cont'd)

	WRPA 2											
	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	2,435	2,433	164	933	4,868	1,097	58,845	6,393	2,181	3,263	65,238	5,444
Municipal	(795)	(794)	(0)	(769)	(1,589)	(769)	(1,551)	(1,550)	(0)	(1,082)	(3,101)	(1,082)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(55,200)	(2,750)	(1,968)	(1,968)	(57,950)	(3,936)
Fish and Wildlife	(1,640)	(1,639)	(164)	(164)	(3,279)	(328)	(2,094)	(2,093)	(213)	(213)	(4,187)	(426)
Water Surface	26,653	26,650	0	625	53,303	625	5,576	74	144	639	5,650	783
Recreation												
Small Water	(18,421)	(18,421)	(0)	(260)	(36,842)	(260)	(0)	(0)	(0)	(260)	(0)	(260)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(5,500)	(0)	(144)	(0)	(5,500)	(144)
Stream Access	(263)	(262)	(0)	(53)	(525)	(53)	(38)	(37)	(0)	(60)	(75)	(60)
Fish and Wildlife	(828)	(827)	(0)	(166)	(1,655)	(166)	(38)	(37)	(0)	(173)	(75)	(173)
Natural Environment	(7,141)	(7,140)	(0)	(146)	(14,281)	(146)	(0)	(0)	(0)	(146)	(0)	(146)
Lands	34,414	17,799	1,200	1,668	52,213	2,868	21,705	21,705	2,257	2,980	43,410	5,237
Recreation	(9,750)	(9,750)	(1,200)	(1,200)	(19,500)	(2,400)	(10,575)	(10,575)	(2,257)	(2,258)	(21,150)	(4,515)
Fish and Wildlife	(23,754)	(2,639)	(0)	(430)	(26,393)	(430)	(11,130)	(11,130)	(0)	(684)	(22,260)	(684)
Natural Environment	(910)	(5,410)	(0)	(38)	(6,320)	(38)	(0)	(0)	(0)	(38)	(0)	(38)
Flood Control & Related Problems	198,769	119,547	153	4,380	318,316	4,533	111,452	115,315	349	8,926	226,767	9,275
Flood Control												
Principal Reaches	(73,931)	(8,221)	(50)	(136)	(82,152)	(186)	(93,642)	(6,548)	(232)	(417)	(100,190)	(649)
Upstream	(76,442)	(17,558)	(0)	(2,149)	(94,000)	(2,149)	(5,475)	(1,460)	(0)	(2,175)	(6,935)	(2,175)
Land Treatment	(7,038)	(76,606)	(0)	(0)	(83,644)	(0)	(8,293)	(86,718)	(0)	(0)	(95,011)	(0)
Sediment and Erosion												
Critical Land Treatment	(2,419)	(1,197)	(0)	(0)	(3,616)	(0)	(1,217)	(600)	(0)	(0)	(1,817)	(0)
Streambank	(3,821)	(18)	(103)	(89)	(3,839)	(192)	(1,337)	(11)	(117)	(143)	(1,348)	(260)
Roadbanks	(179)	(97)	(0)	(8)	(276)	(8)	(157)	(84)	(0)	(16)	(241)	(16)
Drainage												
Watershed Management	(379)	(7,210)	(0)	(1,518)	(7,589)	(1,518)	(1,043)	(19,822)	(0)	(5,691)	(20,865)	(5,691)
Channels	(34,560)	(8,640)	(0)	(480)	(43,200)	(480)	(288)	(72)	(0)	(484)	(360)	(484)
Water Quality and Pollution	7,022	3,886	0	339	10,908	339	24,824	8,559	0	363	33,383	363
Municipal Waste Treatment	(7,022)	(2,340)	(0)	(70)	(9,362)	(70)	(24,824)	(8,275)	(0)	(45)	(33,099)	(45)
Bacteria Control	(0)	(1,546)	(0)	(269)	(1,546)	(269)	(0)	(284)	(0)	(318)	(284)	(318)
Navigation	182,500	6,100	760	110	188,600	870	3,100	550	1,210	170	3,650	1,380
Hydropower	3,953	0	80	0	3,953	80	26,300	0	490	0	26,300	490
Historical and Archeological	3,989	3,989	0	0	7,978	0	11,177	11,177	0	0	22,354	0
Health	0	0	0	530	0	530	0	0	0	1,078	0	1,078
TOTALS	459,734	180,404	2,357	8,585	640,139	10,942	262,979	163,773	6,631	17,419	426,752	24,050

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

WRPA 2 (Cont'd)

Feature	2001-2020 Investment Federal	Investment Non-Federal	Annual O&M Federal	Annual O&M Non-Federal	Totals Investment	Totals O&M	Total Investment Cost ($1,000) Federal	Non-Federal	Total
Water Supply	5,297	5,296	2,269	3,845	10,593	6,114	66,576	14,123	80,699
Municipal	(2,329)	(2,329)	(0)	(1,577)	(4,658)	(1,577)	(4,675)	(4,673)	(9,348)
Irrigation	(0)	(0)	(1,968)	(1,968)	(0)	(3,936)	(55,200)	(2,750)	(57,950)
Fish and Wildlife	(2,968)	(2,967)	(301)	(300)	(5,935)	(601)	(6,701)	(6,700)	(13,401)
Water Surface	27,474	27,474	144	1,037	54,948	1,181	59,703	54,198	113,901
Recreation									
Small Water	(27,419)	(27,419)	(0)	(647)	(54,838)	(647)	(45,840)	(45,840)	(91,680)
Large Water	(0)	(0)	(144)	(0)	(0)	(144)	(5,500)	(0)	(5,500)
Stream Access	(37)	(38)	(0)	(67)	(75)	(67)	(338)	(337)	(675)
Fish and Wildlife	(18)	(17)	(0)	(177)	(35)	(177)	(884)	(881)	(1,765)
Natural Environment	(0)	(0)	(0)	(146)	(0)	(146)	(7,141)	(7,140)	(14,281)
Lands	68,623	68,622	7,533	8,617	137,245	16,150	124,742	108,126	232,868
Recreation	(52,750)	(52,750)	(7,533)	(7,532)	(105,500)	(15,065)	(73,075)	(73,075)	(146,150)
Fish and Wildlife	(15,873)	(15,872)	(0)	(1,047)	(31,745)	(1,047)	(50,757)	(29,641)	(80,398)
Natural Environment	(0)	(0)	(0)	(38)	(0)	(38)	(910)	(5,410)	(6,320)
Flood Control & Related Problems	50,368	124,224	416	14,899	174,592	15,315	360,589	359,086	719,675
Flood Control									
Principal Reaches	(34,965)	(0)	(284)	(476)	(34,965)	(760)	(202,538)	(14,769)	(217,307)
Upstream	(1,180)	(189)	(0)	(2,193)	(1,369)	(2,193)	(83,097)	(19,207)	(102,304)
Land Treatment	(9,823)	(95,566)	(0)	(0)	(105,389)	(0)	(25,154)	(258,890)	(284,044)
Sediment and Erosion									
Critical Land Treatment	(810)	(400)	(0)	(0)	(1,210)	(0)	(4,446)	(2,197)	(6,643)
Streambank	(1,009)	(7)	(132)	(178)	(1,016)	(310)	(6,167)	(36)	(6,203)
Roadbanks	(112)	(60)	(0)	(21)	(172)	(21)	(448)	(241)	(689)
Drainage									
Watershed Management	(1,461)	(27,750)	(0)	(11,533)	(29,211)	(11,533)	(2,883)	(54,782)	(57,665)
Channels	(1,008)	(252)	(0)	(498)	(1,260)	(498)	(35,856)	(8,964)	(44,820)
Water Quality and Pollution	25,102	8,720	0	448	33,822	448	56,948	21,165	78,113
Municipal Waste Treatment	(25,102)	(8,367)	(0)	(60)	(33,469)	(60)	(56,948)	(18,982)	(75,930)
Bacteria Control	(0)	(353)	(0)	(388)	(353)	(388)	(0)	(2,183)	(2,183)
Navigation	80	20	1,214	171	100	1,385	185,680	6,670	192,350
Hydropower	0	0	490	0	0	490	30,253	0	30,253
Historical and Archeological	5,075	5,075	0	0	10,150	0	20,241	20,241	40,482
Health	0	0	0	1,534	0	1,534	0	0	0
TOTALS	182,019	239,431	12,066	30,551	421,450	42,617	904,732	583,609	1,488,341

Table 121 - Estimated Program Costs, National Income Objective (All Costs in $1,000) Cont'd

	WRPA 3											
	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	4,135	4,135	37	3,218	8,270	3,255	8,704	8,704	63	5,023	17,408	5,086
Municipal	(3,773)	(3,773)	(0)	(3,182)	(7,546)	(3,182)	(8,080)	(8,080)	(0)	(4,961)	(16,160)	(4,961)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(362)	(362)	(37)	(36)	(724)	(73)	(624)	(624)	(63)	(62)	(1,248)	(125)
Water Surface	263,113	59,513	710	1,141	322,626	1,851	242,876	69,776	1,580	2,294	312,652	3,874
Recreation												
Small Water	(58,528)	(58,528)	(0)	(944)	(117,056)	(944)	(69,626)	(69,626)	(0)	(2,067)	(139,252)	(2,067)
Large Water	(203,600)	(0)	(710)	(0)	(203,600)	(710)	(173,100)	(0)	(1,580)	(0)	(173,100)	(1,580)
Stream Access	(300)	(300)	(0)	(60)	(600)	(60)	(75)	(75)	(0)	(75)	(150)	(75)
Fish and Wildlife	(685)	(685)	(0)	(137)	(1,370)	(137)	(75)	(75)	(0)	(152)	(150)	(152)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	102,059	524,270	8,160	8,482	626,329	16,642	67,343	67,342	15,678	16,151	134,685	31,829
Recreation	(77,475)	(77,475)	(8,160)	(8,160)	(154,950)	(16,320)	(60,675)	(60,675)	(15,678)	(15,677)	(121,350)	(31,355)
Fish and Wildlife	(21,982)	(2,443)	(0)	(291)	(24,425)	(291)	(6,668)	(6,667)	(0)	(443)	(13,335)	(443)
Natural Environment	(2,602)	(444,352)	(0)	(31)	(446,954)	(31)	(0)	(0)	(0)	(31)	(0)	(31)
Flood Control & Related Problems	158,009	85,196	595	1,533	243,205	2,128	90,336	73,366	1,025	2,393	163,702	3,418
Flood Control												
Principal Reaches	(68,067)	(11,331)	(559)	(197)	(79,398)	(756)	(36,621)	(3,215)	(965)	(197)	(39,836)	(1,162)
Upstream 2/	(54,148)	(14,243)	(0)	(556)	(68,391)	(556)	(29,570)	(7,656)	(0)	(815)	(37,226)	(815)
Land Treatment	(4,682)	(51,086)	(0)	(0)	(55,768)	(0)	(5,166)	(56,924)	(0)	(0)	(62,090)	(0)
Sediment and Erosion												
Critical Land Treatment	(15,622)	(7,793)	(0)	(0)	(23,415)	(0)	(8,590)	(4,281)	(0)	(0)	(12,871)	(0)
Streambank	(14,545)	(140)	(36)	(698)	(14,685)	(734)	(8,745)	(83)	(60)	(1,116)	(8,828)	(1,176)
Roadbanks	(225)	(121)	(0)	(10)	(346)	(10)	(197)	(106)	(0)	(19)	(303)	(19)
Drainage												
Watershed Management	(16)	(306)	(0)	(64)	(322)	(64)	(39)	(749)	(0)	(222)	(788)	(222)
Channels	(704)	(176)	(0)	(8)	(880)	(8)	(1,408)	(352)	(0)	(24)	(1,760)	(24)
Water Quality and Pollution	57,224	22,065	0	586	79,289	586	148,769	50,304	0	744	199,073	744
Municipal Waste Treatment	(57,224)	(19,074)	(0)	(50)	(76,298)	(50)	(148,769)	(49,589)	(0)	(72)	(198,358)	(72)
Bacteria Control	(0)	(2,991)	(0)	(536)	(2,991)	(536)	(0)	(715)	(0)	(672)	(715)	(672)
Navigation	5,000	1,000	6	1	6,000	7	300	100	56	11	400	67
Hydropower	0	0	0	0	0	0	0	0	0	0	0	0
Historical and Archeological	5,101	5,100	0	0	10,201	0	10,366	10,366	0	0	20,732	0
Health	0	0	0	159	0	159	0	0	0	385	0	385
TOTALS	594,641	701,279	9,508	15,120	1,295,920	24,628	568,694	279,958	18,402	27,001	848,652	45,403

Table 121 - Estimated Program Costs, National Income Objective (All Costs in $1,000) Cont'd

	WRPA 3 (Cont'd)								
	2001-2020						Total Investment Costs ($1,000)		
	Investment		Annual O&M		Totals				
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Total
Water Supply	10,820	10,819	104	7,309	21,639	7,413	23,659	23,658	47,317
Municipal	(9,781)	(9,781)	(0)	(7,205)	(19,562)	(7,205)	(21,634)	(21,634)	(43,268)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(1,039)	(1,038)	(104)	(104)	(2,077)	(208)	(2,025)	(2,024)	(4,049)
Water Surface	114,416	114,416	1,580	4,167	228,832	5,747	620,405	243,705	864,110
Recreation									
Small Water	(114,266)	(114,266)	(0)	(3,910)	(228,532)	(3,910)	(242,420)	(242,420)	(484,840)
Large Water	(0)	(0)	(1,580)	(0)	(0)	(1,580)	(376,700)	(0)	(376,700)
Stream Access	(75)	(75)	(0)	(90)	(150)	(90)	(450)	(450)	(900)
Fish and Wildlife	(75)	(75)	(0)	(167)	(150)	(167)	(835)	(835)	(1,670)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	144,127	144,128	31,440	32,131	288,255	63,571	313,529	735,740	1,049,269
Recreation	(134,625)	(134,625)	(31,440)	(31,440)	(269,250)	(62,880)	(272,775)	(272,775)	(545,550)
Fish and Wildlife	(9,502)	(9,503)	(0)	(660)	(19,005)	(660)	(38,152)	(18,613)	(56,765)
Natural Environment	(0)	(0)	(0)	(31)	(0)	(31)	(2,602)	(444,352)	(446,954)
Flood Control & Related Problems	46,319	72,106	1,078	3,067	118,425	4,145	294,664	230,668	525,332
Flood Control									
Principal Reaches	(2,475)	(688)	(996)	(197)	(3,163)	(1,193)	(107,163)	(15,234)	(122,397)
Upstream 2/	(28,414)	(7,513)	(0)	(971)	(35,927)	(971)	(112,132)	(29,412)	(141,544)
Land Treatment	(6,328)	(61,516)	(0)	(0)	(67,844)	(0)	(16,176)	(169,526)	(185,702)
Sediment and Erosion									
Critical Land Treatment	(1,884)	(945)	(0)	(0)	(2,829)	(0)	(26,096)	(13,019)	(39,115)
Streambank	(5,967)	(56)	(82)	(1,394)	(6,023)	(1,476)	(29,257)	(279)	(29,536)
Roadbanks	(140)	(76)	(0)	(26)	(216)	(26)	(562)	(303)	(865)
Drainage									
Watershed Management	(55)	(1,048)	(0)	(443)	(1,103)	(443)	(110)	(2,103)	(2,213)
Channels	(1,056)	(264)	(0)	(36)	(1,320)	(36)	(3,168)	(792)	(3,960)
Water Quality and Pollution	92,355	31,517	0	768	123,872	768	298,348	103,886	402,234
Municipal Waste Treatment	(92,355)	(30,785)	(0)	(96)	(123,140)	(96)	(298,348)	(99,448)	(397,796)
Bacteria Control	(0)	(732)	(0)	(672)	(732)	(672)	(0)	(4,438)	(4,438)
Navigation	0	0	56	11	0	67	5,300	1,100	6,400
Hydropower	0	0	0	0	0	0	0	0	0
Historical and Archeological	6,400	6,400	0	0	12,800	0	21,867	21,866	43,733
Health	0	690	0	692	0	692	0	0	0
TOTALS	414,437	379,386	34,258	48,145	793,823	82,403	1,577,772	1,360,623	2,938,395

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

	WRPA 4											
	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	1,695	1,695	16	2,156	3,390	2,172	2,940	2,938	26	2,960	5,878	2,986
Municipal	(1,591)	(1,591)	(0)	(2,140)	(3,182)	(2,140)	(2,785)	(2,784)	(0)	(2,935)	(5,569)	(2,935)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(104)	(104)	(16)	(16)	(208)	(32)	(155)	(154)	(26)	(25)	(309)	(51)
Water Surface	9,927	9,925	0	297	19,852	297	54,510	54,510	0	995	109,020	995
Recreation												
Small Water	(9,006)	(9,006)	(0)	(113)	(18,012)	(113)	(54,435)	(54,435)	(0)	(796)	(108,870)	(796)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(188)	(187)	(0)	(38)	(375)	(38)	(37)	(38)	(0)	(45)	(75)	(45)
Fish and Wildlife	(733)	(732)	(0)	(146)	(1,465)	(146)	(38)	(37)	(0)	(154)	(75)	(154)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	60,386	269,506	3,360	3,738	329,892	7,098	29,475	29,475	5,705	6,255	58,950	11,960
Recreation	(35,100)	(35,100)	(3,360)	(3,360)	(70,200)	(6,720	(21,950)	(21,950)	(5,705)	(5,705)	(43,900)	(11,410)
Fish and Wildlife	(24,615)	(2,735)	(0)	(369)	(27,350)	(369)	(7,525)	(7,525)	(0)	(541)	(15,050)	(541)
Natural Environment	(671)	(231,671)	(0)	(9)	(232,342)	(9)	(0)	(0)	(0)	(9)	(9)	(9)
Flood Control & Related Problems	277,674	91,284	2,191	2,253	368,958	4,444	78,853	93,384	3,349	5,081	172,237	8,430
Flood Control												
Principal Reaches	(188,287)	(382)	(1,778)	(287)	(188,669)	(2,065)	(41,221)	(1,309)	(2,207)	(287)	(42,530)	(2,494)
Upstream1/	(21,431)	(7,020)	(0)	(172)	(28,451)	(172)	(2,704)	(429)	(0)	(186)	(3,133)	(186)
Land Treatment	(6,254)	(65,837)	(0)	(0)	(72,091)	(0)	(7,440)	(76,281)	(0)	(0)	(83,721)	(0)
Sediment and Erosion												
Critical Land Treatment	(8,444)	(4,216)	(0)	(0)	(12,660)	(0)	(5,724)	(2,843)	(0)	(0)	(8,567)	(0)
Streambank	(16,286)	(69)	(413)	(343)	(16,355)	(756)	(20,828)	(41)	(1,142)	(549)	(20,869)	(1,691)
Roadbanks	(328)	(176)	(0)	(15)	(504)	(15)	(287)	(154)	(0)	(28)	(441)	(28)
Drainage												
Watershed Management	(236)	(4,482)	(0)	(944)	(4,718)	(944)	(649)	(12,327)	(0)	(3,539)	(12,976)	(3,539)
Channels	(36,408)	(9,102)	(0)	(492)	(45,510)	(492)	(0)	(0)	(0)	(492)	(0)	(492)
Water Quality and Pollution	11,036	5,476	0	382	16,512	382	27,365	9,442	0	430	36,807	430
Municipal Waste Treatment	(11,036)	(3,679)	(0)	(59)	(14,715)	(59)	(27,365)	(9,121)	(0)	(52)	(36,486)	(52)
Bacteria Control	(0)	(1,797)	(0)	(323)	(1,797)	(323)	(0)	(321)	(0)	(378)	(321)	(378)
Navigation	142,729	11,341	1,871	0	154,070	1,871	1,120	160	1,971	0	1,280	1,971
Hydropower	12,636	0	60	0	12,636	60	0	0	60	0	0	60
Historical and Archeological	1,309	1,309	0	0	2,618	0	7,286	7,286	0	0	14,572	0
Health	0	0	0	983	0	983	0	0	0	1,937	0	1,937
TOTALS	517,392	390,536	7,498	9,809	907,928	17,307	201,549	197,195	11,111	17,658	398,744	28,769

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

WRPA 4 (Cont'd)

Feature	2001-2020 Investment Federal	Investment Non-Federal	Annual O&M Federal	Annual O&M Non-Federal	Totals Investment	Totals O&M	Total Investment Cost $1,000 Federal	Non-Federal	Total
Water Supply	4,296	4,297	36	4,116	8,593	4,152	8,931	8,930	17,861
Municipal	(4,094)	(4,094)	(0)	(4,081)	(8,188)	(4,081)	(8,470)	(8,469)	(16,939)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(202)	(203)	(36)	(35)	(405)	(71)	(461)	(461)	(922)
Water Surface	31,478	31,476	0	1,404	62,954	1,404	95,915	95,911	191,826
Recreation									
Small Water	(31,402)	(31,402)	(0)	(1,190)	(62,804)	(1,190)	(94,843)	(94,843)	(189,686)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(38)	(37)	(0)	(53)	(75)	(53)	(263)	(262)	(525)
Fish and Wildlife	(38)	(37)	(0)	(161)	(75)	(161)	(809)	(806)	(1,615)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	49,478	49,477	10,630	11,425	98,955	22,055	139,339	348,458	487,797
Recreation	(38,750)	(38,750)	(10,630)	(10,630)	(77,500)	(21,260)	(95,800)	(95,800)	(191,600)
Fish and Wildlife	(10,728)	(10,727)	(0)	(786)	(21,455)	(786)	(42,868)	(20,987)	(63,855)
Natural Environment	(0)	(0)	(0)	(9)	(0)	(9)	(671)	(231,671)	(232,342)
Flood Control & Related Problems	100,721	99,864	4,728	9,066	200,585	13,794	457,248	284,532	741,780
Flood Control									
Principal Reaches	(57,323)	(0)	(2,858)	(2,087)	(57,323)	(3,145)	(286,831)	(1,691)	(288,522)
Upstream 1/	(11,599)	(3,199)	(0)	(392)	(14,798)	(392)	(35,734)	(10,648)	(46,382)
Land Treatment	(8,440)	(77,881)	(0)	(0)	(86,321)	(0)	(22,134)	(219,999)	(242,133)
Sediment and Erosion									
Critical Land Treatment	(2,788)	(1,389)	(0)	(0)	(4,177)	(0)	(16,956)	(8,448)	(25,404)
Streambank	(19,459)	(27)	(1,870)	(685)	(19,486)	(2,555)	(56,573)	(137)	(56,710)
Roadbanks	(204)	(110)	(0)	(38)	(314)	(38)	(819)	(440)	(1,259)
Drainage									
Watershed Management	(908)	(17,258)	(0)	(7,172)	(18,166)	(7,172)	(1,793)	(34,067)	(35,860)
Channels	(0)	(0)	(0)	(492)	(0)	(492)	(36,408)	(9,102)	(45,510)
Water Quality and Pollution	21,174	7,437	0	505	28,611	505	59,575	22,355	81,930
Municipal Waste Treatment	(21,174)	(7,058)	(0)	(59)	(28,232)	(59)	(59,575)	(19,858)	(79,433)
Bacteria Control	(0)	(379)	(0)	(446)	(379)	(446)	(0)	(2,497)	(2,497)
Navigation	2,240	320	2,171	0	2,560	2,171	146,089	11,821	157,910
Hydropower	0	0	60	0	0	60	12,636	0	12,636
Historical and Archeological	970	970	0	0	1,940	0	9,565	9,565	19,130
Health	0	0	0	2,566	0	2,566	0	0	0
TOTALS	210,357	193,841	17,625	29,082	404,198	46,707	929,298	781,572	1,710,870

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

	WRPA 5											
	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	1,712	1,711	102	2,271	3,423	2,373	3,148	3,147	124	3,090	6,295	3,214
Municipal	(1,569)	(1,569)	(0)	(2,169)	(3,138)	(2,169)	(2,899)	(2,898)	(0)	(2,967)	(5,797)	(2,967)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(143)	(142)	(102)	(102)	(285)	(204)	(249)	(249)	(124)	(123)	(498)	(247)
Water Surface	46,505	32,371	0	788	78,776	788	480	480	0	835	960	835
Recreation												
Small Water	(17,640)	(17,640)	(0)	(280)	(35,280)	(280)	(315)	(315)	(0)	(295)	(630)	(295)
Large Water	(28,099)	(14,067)	(0)	(374)	(42,166)	(374)	(0)	(0)	(0)	(374)	(0)	(374)
Stream Access	(38)	(37)	(0)	(8)	(75)	(8)	(37)	(38)	(0)	(15)	(75)	(15)
Fish and Wildlife	(628)	(627)	(0)	(126)	(1,255)	(126)	(128)	(127)	(0)	(151)	(255)	(151)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	78,625	425,788	3,753	4,179	504,413	7,932	49,095	49,095	7,673	8,341	98,190	16,014
Recreation	(46,500)	(46,500)	(3,750)	(3,750)	(93,000)	(7,500)	(38,525)	(38,525)	(7,670)	(7,670)	(77,050)	(15,340)
Fish and Wildlife	(30,191)	(3,355)	(0)	(414)	(33,546)	(414)	(10,570)	(10,570)	(0)	(656)	(21,140)	(656)
Natural Environment	(1,934)	(375,933)	(3)	(15)	(377,867)	(18)	(0)	(0)	(3)	(15)	(0)	(18)
Flood Control & Related Problems	122,374	112,194	280	665	234,568	945	76,976	126,775	667	1,863	203,751	2,530
Flood Control												
Principal Reaches	(80,958)	(826)	(280)	(0)	(81,784)	(280)	(63,154)	(8,569)	(586)	(0)	(71,723)	(586)
Upstream 1/	(27,199)	(4,468)	(0)	(53)	(31,667)	(53)	(2,640)	(625)	(0)	(112)	(3,265)	(112)
Land Treatment	(4,669)	(102,515)	(0)	(0)	(107,184)	(0)	(5,179)	(111,760)	(0)	(0)	(116,939)	(0)
Sediment and Erosion												
Critical Land Treatment	(1,923)	(942)	(0)	(0)	(2,865)	(0)	(552)	(272)	(0)	(0)	(824)	(0)
Streambank	(2,232)	(23)	(0)	(113)	(2,255)	(113)	(3,121)	(13)	(81)	(180)	(3,134)	(261)
Roadbanks	(477)	(257)	(0)	(22)	(734)	(22)	(418)	(225)	(0)	(41)	(643)	(41)
Drainage												
Watershed Management	(103)	(1,960)	(0)	(413)	(2,063)	(413)	(258)	(4,897)	(0)	(1,444)	(5,155)	(1,444)
Channels	(4,813)	(1,203)	(0)	(64)	(6,016)	(64)	(1,654)	(414)	(0)	(86)	(2,068)	(86)
Water Quality and Pollution	10,240	4,818	0	324	15,058	324	32,680	11,109	0	358	43,789	358
Municipal Waste Treatment	(10,240)	(3,413)	(0)	(70)	(13,653)	(70)	(32,680)	(10,893)	(0)	(68)	(43,573)	(68)
Bacteria Control	(0)	(1,405)	(0)	(254)	(1,405)	(254)	(0)	(216)	(0)	(290)	(216)	(290)
Navigation	96,600	1,800	1,351	0	99,400	1,351	6,133	2,982	1,596	0	9,115	1,596
Hydropower	2,600	0	114	0	2,600	114	11,875	0	214	0	11,875	214
Historical and Archeological	2,882	2,882	0	0	3,170	0	11,741	11,741	0	0	23,482	0
Health	0	0	0	445	0	445	0	0	0	1,006	0	1,006
TOTALS	362,438	581,564	5,600	8,672	944,002	14,272	192,128	205,329	10,274	15,493	397,457	25,767

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

WRPA 5 (Cont'd)

Feature	2001-2020 Investment Federal	2001-2020 Investment Non-Federal	2001-2020 Annual O&M Federal	2001-2020 Annual O&M Non-Federal	2001-2020 Totals Investment	2001-2020 Totals O&M	Total Investment Costs ($1,000) Federal	Total Investment Costs ($1,000) Non-Federal	Total Investment Costs ($1,000) Total
Water Supply	5,337	5,336	150	4,553	10,673	4,703	10,197	10,194	20,391
Municipal	(5,073)	(5,072)	(0)	(4,404)	(10,145)	(4,404)	(9,541)	(9,539)	(19,080)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(264)	(264)	(150)	(149)	(528)	(299)	(656)	(655)	(1,311)
Water Surface	44,367	44,365	0	1,566	88,732	1,566	91,252	77,216	168,468
Recreation									
Small Water	(44,226)	(44,226)	(0)	(997)	(88,452)	(997)	(62,181)	(62,181)	(124,362)
Large Water	(0)	(0)	(0)	(374)	(0)	(374)	(28,099)	(14,067)	(42,166)
Stream Access	(38)	(37)	(0)	(23)	(75)	(23)	(113)	(112)	(225)
Fish and Wildlife	(103)	(102)	(0)	(172)	(205)	(172)	(859)	(856)	(1,715)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	70,235	70,235	13,953	14,966	140,470	28,919	197,955	545,118	743,073
Recreation	(55,150)	(55,150)	(13,950)	(13,950)	(110,300)	(27,900)	(140,175)	(140,175)	(280,350)
Fish and Wildlife	(15,085)	(15,085)	(0)	(1,001)	(30,170)	(1,001)	(55,846)	(29,010)	(84,856)
Natural Environment	(0)	(0)	(3)	(15)	(0)	(18)	(1,934)	(375,933)	(377,867)
Flood Control & Related Problems	27,501	138,716	757	3,465	166,217	4,222	226,851	377,685	604,536
Flood Control									
Principal Reaches	(3,993)	(933)	(595)	(0)	(4,926)	(595)	(148,105)	(10,328)	(158,433)
Upstream 1/	(10,648)	(1,851)	(0)	(169)	(12,499)	(169)	(40,487)	(6,944)	(47,431)
Land Treatment	(5,843)	(127,898)	(0)	(0)	(133,741)	(0)	(15,691)	(342,173)	(357,864)
Sediment and Erosion									
Critical Land Treatment	(369)	(181)	(0)	(0)	(550)	(0)	(2,844)	(1,395)	(4,239)
Streambank	(2,680)	(9)	(162)	(224)	(2,689)	(386)	(8,033)	(45)	(8,078)
Roadbanks	(298)	(161)	(0)	(55)	(459)	(55)	(1,193)	(643)	(1,836)
Drainage									
Watershed Management	(361)	(6,856)	(0)	(2,887)	(7,217)	(2,887)	(722)	(13,713)	(14,435)
Channels	(3,309)	(827)	(0)	(130)	(4,136)	(130)	(9,776)	(2,444)	(12,220)
Water Quality and Pollution	27,931	9,665	0	426	37,596	426	70,851	25,592	96,443
Municipal Waste Treatment	(27,931)	(9,310)	(0)	(77)	(37,241)	(77)	(70,851)	(23,616)	(94,467)
Bacteria Control	(0)	(355)	(0)	(349)	(355)	(349)	(0)	(1,976)	(1,976)
Navigation	2,240	320	1,796	0	2,560	1,796	105,973	5,102	111,075
Hydropower	0	0	214	0	0	214	14,475	0	14,475
Historical and Archeological	3,000	3,000	0	0	6,000	0	17,623	17,623	35,246
Health	0	0	0	1,572	0	1,572	0	0	0
TOTALS	180,611	271,637	16,870	26,548	452,248	43,418	735,177	1,058,530	1,793,707

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

WRPA 6

Feature	1971-1980 Investment Federal	1971-1980 Investment Non-Federal	1971-1980 Annual O&M Federal	1971-1980 Annual O&M Non-Federal	1971-1980 Totals Investment	1971-1980 Totals O&M	1981-2000 Investment Federal	1981-2000 Investment Non-Federal	1981-2000 Annual O&M Federal	1981-2000 Annual O&M Non-Federal	1981-2000 Totals Investment	1981-2000 Totals O&M
Water Supply	223	222	27	342	445	369	352	351	33	427	703	460
Municipal	(186)	(185)	(0)	(315)	(371)	(315)	(286)	(285)	(0)	(395)	(571)	(395)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(37)	(37)	(27)	(27)	(74)	(54)	(66)	(66)	(33)	(32)	(132)	(65)
Water Surface	591	589	0	118	1,180	118	1,674	1,674	0	154	3,348	154
Recreation												
Small Water	(0)	(0)	(0)	(0)	(0)	(0)	(1,594)	(1,594)	(0)	(20)	(3,188)	(20)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(263)	(262)	(0)	(53)	(525)	(53)	(37)	(38)	(0)	(60)	(75)	(60)
Fish and Wildlife	(328)	(327)	(0)	(65)	(655)	(65)	(43)	(42)	(0)	(74)	(85)	(74)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	15,489	68,001	840	942	83,490	1,782	4,748	4,747	1,160	1,309	9,495	2,469
Recreation	(8,650)	(8,650)	(840)	(840)	(17,300	(1,680)	(2,700)	(2,700)	(1,160)	(1,160)	(5,400)	(2,320)
Fish and Wildlife	(6,736)	(749)	(0)	(100)	(7,485)	(100)	(2,048)	(2,047)	(0)	(147)	(4,095)	(147)
Natural Environment	(103)	(58,602)	(0)	(2)	(58,705)	(2)	(0)	(0)	(0)	(2)	(0)	(2)
Flood Control & Related Problems	96,327	37,950	393	1,084	134,277	1,477	27,862	36,127	629	2,357	63,989	2,986
Flood Control												
Principal Reaches	(64,775)	(324)	(393)	(0)	(65,099)	(393)	(16,307)	(62)	(461)	(0)	(16,369)	(461)
Upstream 1/	(18,290)	(6,951)	(0)	(492)	(25,241)	(492)	(1,968)	(863)	(0)	(554)	(2,831)	(554)
Land Treatment	(2,273)	(25,989)	(0)	(0)	(28,262)	(0)	(2,694)	(29,007)	(0)	(0)	(31,701)	(0)
Sediment and Erosion												
Critical Land Treatment	(175)	(84)	(0)	(0)	(259)	(0)	(68)	(33)	(0)	(0)	(101)	(0)
Streambanks	(400)	(4)	(0)	(20)	(404)	(20)	(3,985)	(2)	(168)	(33)	(3,987)	(201)
Roadbanks	(67)	(36)	(0)	(3)	(103)	(3)	(59)	(32)	(0)	(6)	(91)	(6)
Drainage												
Watershed Management	(105)	(2,002)	(0)	(421)	(2,107)	(421)	(290)	(5,505)	(0)	(1,580)	(5,795)	(1,580)
Channels	(10,242)	(2,560)	(0)	(148)	(12,802)	(148)	(2,491)	(623)	(0)	(184)	(3,114)	(184)
Water Quality and Pollution	2,843	1,426	0	87	4,269	87	5,160	1,745	0	93	6,905	93
Municipal Waste Treatment	(2,843)	(948)	(0)	(37)	(3,791)	(37)	(5,160)	(1,720)	(0)	(34)	(6,880)	(34)
Bacteria Control	(0)	(478)	(0)	(50)	(478)	(50)	(0)	(25)	(0)	(59)	(25)	(59)
Navigation	3,690	1,560	340	0	5,250	340	0	0	340	0	0	340
Hydropower	0	0	0	0	0	0	0	0	0	0	0	0
Historical and Archeological	1,866	1,866	0	0	3,732	0	3,762	3,762	0	0	7,524	0
Health	0	0	0	642	0	642	0	0	0	953	0	953
TOTALS	121,029	111,614	1,600	3,215	232,643	4,815	43,558	48,406	2,162	5,293	91,964	7,455

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

	W R P A 6 (Cont'd)								
	2001-2020						Total Investment Cost $1,000		
	Investment		Annual O&M		Totals				
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Total
Water Supply	489	487	40	549	976	589	1,064	1,060	2,124
Municipal	(406)	(406)	(0)	(509)	(811)	(509)	(878)	(875)	(1,753)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(83)	(82)	(40)	(40)	(165)	(80)	(186)	(185)	(371)
Water Surface	8,095	8,095	0	279	16,190	279	10,360	10,358	20,718
Recreation									
Small Water	(7,970)	(7,970)	(0)	(120)	(15,940)	(120)	(9,564)	(9,564)	(19,128)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(0)	(0)	(0)	(60)	(0)	(60)	(300)	(300)	(600)
Fish and Wildlife	(125)	(125)	(0)	(99)	(250)	(99)	(496)	(494)	(990)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	7,473	7,472	1,615	1,831	14,945	3,446	27,710	80,220	107,930
Recreation	(4,550)	(4,550)	(1,615)	(1,615)	(9,100)	(3,230)	(15,900)	(15,900)	(31,800)
Fish and Wildlife	(2,923)	(2,922)	(0)	(214)	(5,845)	(214)	(11,707)	(5,718)	(17,425)
Natural Environment	(0)	(0)	(0)	(2)	(0)	(2)	(103)	(58,602)	(58,705)
Flood Control & Related Problems	12,780	38,870	892	3,990	51,650	4,819	137,969	112,947	249,916
Flood Control									
Principal Reaches	(5,306)	(0)	(493)	(0)	(5,306)	(493)	(86,388)	(386)	(86,774)
Upstream 1/	(0)	(0)	(0)	(554)	(0)	(554)	(20,258)	(7,814)	(28,072)
Land Treatment	(3,081)	(31,117)	(0)	(0)	(34,198)	(0)	(8,048)	(86,113)	(94,161)
Sediment and Erosion									
Critical Land Treatment	(47)	(22)	(0)	(0)	(69)	(0)	(290)	(139)	(429)
Streambanks	(3,898)	(2)	(336)	(41)	(3,900)	(377)	(8,283)	(8)	(8,291)
Roadbanks	(42)	(22)	(0)	(8)	(64)	(8)	(168)	(90)	(258)
Drainage									
Watershed Management	(406)	(7,707)	(0)	(3,203)	(8,113)	(3,203)	(801)	(15,214)	(16,015)
Channels	(0)	(0)	(0)	(184)	(0)	(184)	(12,733)	(3,183)	(15,916)
Water Quality and Pollution	2,185	757	0	107	2,942	107	10,188	3,928	14,116
Municipal Waste Treatment	(2,185)	(728)	(0)	(35)	(2,913)	(35)	(10,188)	(3,396)	(13,584)
Bacteria Control	(0)	(29)	(0)	(72)	(29)	(72)	(0)	(532)	(532)
Navigation	1,545	330	440	0	1,875	440	5,235	1,890	7,125
Hydropower	0	0	0	0	0	0	0	0	0
Historical and Archeological	3,000	3,000	0	0	6,000	0	8,628	8,628	17,256
Health	0	0	0	1,006	0	1,006	0	0	0
TOTALS	35,567	59,011	2,924	7,762	94,578	10,686	200,154	219,031	419,185

Table 121 - Estimated Program Costs, National Income Objective (All Costs in $1,000) Cont'd

WRPA 7

	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	404	403	2	477	807	479	1,152	1,151	4	687	2,303	691
Municipal	(392)	(391)	(0)	(475)	(783)	(475)	(1,125)	(1,125)	(0)	(683)	(2,250)	(683)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(12)	(12)	(2)	(2)	(24)	(4)	(27)	(26)	(4)	(4)	(53)	(8)
Water Surface	29,350	29,349	0	454	58,699	454	8,715	8,713	0	583	17,428	583
Recreation												
Small Water	(28,975)	(28,974)	(0)	(379)	(57,949)	(379)	(8,639)	(8,639)	(0)	(492)	(17,278)	(492)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(75)	(75)	(0)	(15)	(150)	(15)	(38)	(37)	(0)	(23)	(75)	(23)
Fish and Wildlife	(300)	(300)	(0)	(60)	(600)	(60)	(38)	(37)	(0)	(68)	(75)	(68)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	19,757	39,057	870	993	58,814	1,863	8,720	8,720	1,438	1,630	17,440	3,068
Recreation	(8,900)	(8,900)	(865)	(865)	(17,800)	(1,730)	(5,675)	(5,675)	(1,433)	(1,432)	(11,350)	(2,865)
Fish and Wildlife	(8,100)	(900)	(0)	(120)	(9,000)	(120)	(3,045)	(3,045)	(0)	(190)	(6,090)	(190)
Natural Environment	(2,757)	(29,257)	(5)	(8)	(32,014)	(13)	(0)	(0)	(5)	(8)	(0)	(13)
Flood Control & Related Problems	72,746	45,356	33	596	118,102	629	27,444	37,631	135	945	65,075	1,080
Flood Control												
Principal Reaches	(10,100)	(1,000)	(33)	(0)	11,100	(33)	(3,519)	(391)	(93)	(0)	(3,910)	(93)
Upstream 1/	(50,075)	(9,372)	(0)	(309)	(59,447)	(309)	(17,546)	(3,147)	(0)	(369)	(20,693)	(369)
Land Treatment	(1,625)	(31,174)	(0)	(0)	(32,799)	(0)	(1,850)	(32,383)	(0)	(0)	(34,233)	(0)
Sediment and Erosion												
Critical Land Treatment	(5,544)	(2,759)	(0)	(0)	(8,303)	(0)	(1,273)	(638)	(0)	(0)	(1,911)	(0)
Streambanks	(2,931)	(30)	(0)	(148)	(2,961)	(148)	(2,704)	(18)	(42)	(237)	(2,722)	(279)
Roadbanks	(213)	(115)	(0)	(10)	(328)	(10)	(186)	(100)	(0)	(18)	(286)	(18)
Drainage												
Watershed Management	(18)	(346)	(0)	(73)	(364)	(73)	(46)	(874)	(0)	(257)	(920)	(257)
Channels	(2,240)	(560)	(0)	(56)	(2,800)	(56)	(320)	(80)	(0)	(64)	(400)	(64)
Water Quality and Pollution	2,066	1,018	0	59	3,084	59	5,250	1,806	0	69	7,056	69
Municipal Waste Treatment	(2,066)	(688)	(0)	(1)	(2,754)	(1)	(5,250)	(1,750)	(0)	(2)	(7,000)	(2)
Bacteria Control	(0)	(330)	(0)	(58)	(330)	(58)	(0)	(56)	(0)	(67)	(56)	(67)
Navigation	0	0	0	0	0	0	9,146	1,235	100	0	10,381	100
Hydropower	0	0	0	0	0	0	82,880	0	1,043	0	82,880	1,043
Historical and Archeological	813	813	0	0	1,626	0	3,772	3,771	0	0	7,543	0
Health	0	0	0	41	0	41	0	0	0	88	0	88
TOTALS	125,136	115,996	905	2,620	241,132	3,525	147,079	63,027	2,720	4,002	210,106	6,722

Table 121 - Estimated Program Costs, National Income Objective (All Costs in $1,000) Cont'd

WRPA 7 (Cont'd)

Feature	2001-2020 Investment Federal	Investment Non-Federal	Annual O&M Federal	Annual O&M Non-Federal	Totals Investment	Totals O&M	Total Investment Cost ($1,000 Federal	Non-Federal	Total
Water Supply	1,107	1,106	6	1,019	2,213	1,025	2,663	2,660	5,323
Municipal	(1,076)	(1,075)	(0)	(1,013)	(2,151)	(1,013)	(2,593)	(2,591)	(5,184)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(31)	(31)	(6)	(6)	(62)	(12)	(70)	(69)	(139)
Water Surface	75	75	0	597	150	597	38,140	38,137	76,277
Recreation									
Small Water	(0)	(0)	(0)	(492)	(0)	(492)	(37,614)	(37,613)	(75,227)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(37)	(38)	(0)	(30)	(75)	(30)	(150)	(150)	(300)
Fish and Wildlife	(38)	(37)	(0)	(75)	(75)	(75)	(376)	(374)	(750)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	13,298	13,297	2,385	2,677	26,595	5,062	41,775	61,074	102,849
Recreation	(8,975)	(8,975)	(2,380)	(2,380)	(17,950)	(4,760)	(23,550)	(23,550)	(47,100)
Fish and Wildlife	(4,323)	(4,322)	(0)	(289)	(8,645)	(289)	(15,468)	(8,267)	(23,735)
Natural Environment	(0)	(0)	(5)	(8)	(0)	(13)	(2,757)	(29,257)	(32,014)
Flood Control & Related Problems	6,435	40,903	180	1,268	47,338	1,448	106,625	123,890	230,515
Flood Control									
Principal Reaches	(1,147)	(127)	(96)	(0)	(1,274)	(96)	(14,766)	(1,518)	(16,284)
Upstream 1/	(0)	(0)	(0)	(369)	(0)	(369)	(67,621)	(12,519)	(80,140)
Land Treatment	(2,151)	(39,046)	(0)	(0)	(41,197)	(0)	(5,626)	(102,603)	(108,229)
Sediment and Erosion									
Critical Land Treatment	(845)	(423)	(0)	(0)	(1,268)	(0)	(7,662)	(3,820)	(11,482)
Streambanks	(2,095)	(12)	(84)	(296)	(2,107)	(380)	(7,730)	(60)	(7,790)
Roadbanks	(133)	(71)	(0)	(25)	(204)	(25)	(532)	(286)	(818)
Drainage									
Watershed Management	(64)	(1,224)	(0)	(514)	(1,288)	(514)	(128)	(2,444)	(2,572)
Channels	(0)	(0)	(0)	(64)	(0)	(64)	(2,560)	(640)	(3,200)
Water Quality and Pollution	3,431	1,217	0	84	4,648	84	10,747	4,041	14,788
Municipal Waste Treatment	(3,431)	(1,144)	(0)	(3)	(4,575)	(3)	(10,747)	(3,582)	(14,329)
Bacteria Control	(0)	(73)	(0)	(81)	(73)	(81)	(0)	(459)	(459)
Navigation	0	0	100	0	0	100	9,146	1,235	10,381
Hydropower	0	0	1,043	0	0	1,043	82,880	0	82,880
Historical and Archeological	975	975	0	0	1,950	0	5,560	5,559	11,119
Health	0	0	0	175	0	175	0	0	0
TOTALS	25,321	57,573	3,714	5,820	82,894	9,534	297,536	236,596	534,132

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

	WRPA 8											
	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	1,079	1,078	8	332	2,157	340	3,421	3,420	19	1,050	6,841	1,069
Municipal	(1,071)	(1,071)	(0)	(325)	(2,142)	(325)	(3,402)	(3,402)	(0)	(1,032)	(6,804)	(1,032)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(8)	(7)	(8)	(7)	(15)	(15)	(19)	(18)	(19)	(18)	(37)	(37)
Water Surface	8,169	8,169	0	277	16,338	277	11,278	11,278	0	459	22,556	459
Recreation												
Small Water	(7,314)	(7,314)	(0)	(106)	(14,628)	(106)	(11,178)	(11,178)	(0)	(268)	(22,356)	(268)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(350)	(350)	(0)	(70)	(700)	(70)	(50)	(50)	(0)	(80)	(100)	(80)
Fish and Wildlife	(505)	(505)	(0)	(101)	(1,010)	(101)	(50)	(50)	(0)	(111)	(100)	(111)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	65,956	346,716	5,293	5,360	412,672	10,653	36,685	36,685	10,705	10,786	73,370	21,491
Recreation	(60,425)	(60,425)	(5,293)	(5,292)	(120,850)	(10,585)	(36,125)	(36,125)	(10,705)	(10,705)	(72,250)	(21,410)
Fish and Wildlife	(4,770)	(530)	(0)	(56)	(5,300)	(56)	(560)	(560)	(0)	(69)	(1,120)	(69)
Natural Environment	(761)	(285,761)	(0)	(12)	(286,522)	(12)	(0)	(0)	(0)	(12)	(0)	(12)
Flood Control & Related Problems	29,558	31,387	4	415	60,945	419	30,680	29,251	8	753	59,931	761
Flood Control												
Principal Reaches	(420)	(80)	(4)	(0)	(500)	(4)	(650)	(250)	(8)	(0)	(900)	(8)
Upstream 1/	(19,696)	(5,613)	(0)	(172)	(25,309)	(172)	(25,319)	(5,220)	(0)	(240)	(30,539)	(240)
Land Treatment	(1,142)	(23,595)	(0)	(0)	(24,737)	(0)	(1,204)	(22,241)	(0)	(0)	(23,445)	(0)
Sediment and Erosion												
Critical Land Treatment	(441)	(201)	(0)	(0)	(642)	(0)	(109)	(53)	(0)	(0)	(162)	(0)
Streambanks	(1,694)	(17)	(0)	(86)	(1,711)	(86)	(1,017)	(10)	(0)	(137)	(1,027)	(137)
Roadbanks	(94)	(51)	(0)	(4)	(145)	(4)	(82)	(45)	(0)	(8)	(127)	(8)
Drainage												
Watershed Management	(17)	(316)	(0)	(67)	(333)	(67)	(46)	(869)	(0)	(250)	(915)	(250)
Channels	(6,054)	(1,514)	(0)	(86)	(7,568)	(86)	(2,253)	(563)	(0)	(118)	(2,816)	(118)
Water Quality and Pollution	13,661	5,889	0	256	19,550	256	39,450	13,470	0	320	52,920	320
Municipal Waste Treatment	(13,661)	(4,553)	(0)	(19)	(18,214)	(19)	(39,350)	(13,150)	(0)	(28)	(52,600)	(28)
Bacteria Control	(0)	(1,336)	(0)	(237)	(1,336)	(237)	(0)	(320)	(0)	(292)	(320)	(292)
Navigation	0	0	0	0	0	0	13,900	730	170	0	14,630	170
Hydropower	0	0	0	0	0	0	0	0	0	0	0	0
Historical and Archeological	1,148	1,148	0	0	2,296	0	4,317	4,316	0	0	8,633	0
Health	0	0	0	645	0	645	0	0	0	960	0	960
TOTALS	119,571	394,387	5,305	7,285	513,958	12,590	139,731	99,150	10,902	14,328	238,881	25,230

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

W R P A 8 (Cont'd)

Feature	2001-2020 Investment Federal	Investment Non-Federal	Annual O&M Federal	Annual O&M Non-Federal	Totals Investment	Totals O&M	Total Investment Cost ($1,000) Federal	Non-Federal	Total
Water Supply	6,460	6,459	34	1,981	12,919	2,015	10,960	10,957	21,917
Municipal	(6,426)	(6,426)	(0)	(1,948)	(12,852)	(1,948)	(10,899)	(10,899)	(21,798)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(34)	(33)	(34)	(33)	(67)	(67)	(61)	(58)	(119)
Water Surface	27,838	27,838	0	881	55,676	881	47,285	57,285	94,570
Recreation									
Small Water	(27,738)	(27,738)	(0)	(670)	(55,476)	(670)	(46,230)	(46,230)	(92,460)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(50)	(50)	(0)	(90)	(100)	(90)	(450)	(450)	(900)
Fish and Wildlife	(50)	(50)	(0)	(121)	(100)	(121)	(605)	(605)	(1,210)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	63,888	63,887	19,215	19,314	127,775	38,529	166,529	447,288	613,817
Recreation	(63,100)	(63,100)	(19,215)	(19,215)	(126,200)	(38,430)	(159,650)	(159,650)	(319,300)
Fish and Wildlife	(788)	(787)	(0)	(87)	(1,575)	(87)	(6,118)	(1,877)	(7,995)
Natural Environment	(0)	(0)	(0)	(12)	(0)	(12)	(761)	(285,761)	(286,522)
Flood Control & Related Problems	10,240	28,108	51	1,066	38,348	1,117	70,478	88,746	159,224
Flood Control									
Principal Reaches	(4,530)	(1,700)	(51)	(0)	(6,230)	(51)	(5,600)	(2,030)	(7,630)
Upstream 1/	(3,374)	(595)	(0)	(260)	(3,969)	(260)	(48,389)	(11,428)	(59,817)
Land Treatment	(1,471)	(24,525)	(0)	(0)	(25,996)	(0)	(3,817)	(70,361)	(74,178)
Sediment and Erosion									
Critical Land Treatment	(65)	(32)	(0)	(0)	(97)	(0)	(615)	(286)	(901)
Streambanks	(677)	(7)	(0)	(171)	(684)	(171)	(3,388)	(34)	(3,422)
Roadbanks	(59)	(32)	(0)	(11)	(91)	(11)	(235)	(128)	(363)
Drainage									
Watershed Management	(64)	(1,217)	(0)	(506)	(1,281)	(506)	(127)	(2,402)	(2,529)
Channels	(0)	(0)	(0)	(118)	(0)	(118)	(8,307)	(2,077)	(10,384)
Water Quality and Pollution	27,856	9,659	0	400	37,515	400	80,967	29,018	109,985
Municipal Waste Treatment	(27,856)	(9,285)	(0)	(35)	(37,141)	(35)	(80,967)	(26,988)	(107,955)
Bacteria Control	(0)	(374)	(0)	(365)	(374)	(365)	(0)	(2,030)	(2,030)
Navigation	57,000	3,000	370	0	60,000	370	70,900	3,730	74,630
Hydropower	0	0	0	0	0	0	0	0	0
Historical and Archeological	1,775	1,775	0	0	3,550	0	7,240	7,239	14,479
Health	0	0	0	1,020	0	1,020	0	0	0
TOTALS	195,057	140,726	19,670	24,662	335,783	44,332	454,359	634,263	1,088,622

Table 121 - Estimated Program Costs, National Income Objective (all costs in $1,000) Cont'd

	WRPA 9											
	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	2,212	2,212	265	646	4,424	911	26,881	6,909	1,057	3,724	33,790	4,781
Municipal	(1,260)	(1,260)	(0)	(382)	(2,520)	(382)	(3,402)	(3,402)	(0)	(1,031)	(6,804)	(1,031)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(20,086)	(114)	(0)	(1,636)	(20,200)	(1,636)
Fish and Wildlife	(952)	(952)	(265)	(264)	(1,904)	(529)	(3,393)	(3,393)	(1,057)	(1,057)	(6,786)	(2,114)
Water Surface	730	730	0	186	1,460	186	0	0	0	186	0	186
Recreation												
Small Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(200)	(200)	(0)	(80)	(400)	(80)	(0)	(0)	(0)	(80)	(0)	(80)
Fish and Wildlife	(530)	(530)	(0)	(106)	(1,060)	(106)	(0)	(0)	(0)	(106)	(0)	(106)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	81,853	332,054	5,943	6,058	413,907	12,001	51,848	51,847	10,583	11,177	103,695	21,760
Recreation	(71,150)	(71,150)	(5,940)	(5,940)	(142,300)	(11,880)	(30,900)	(30,900)	(10,580)	(10,580)	(61,800)	(21,160)
Fish and Wildlife	(9,336)	(1,037)	(0)	(108)	(10,373)	(108)	(20,948)	(20,947)	(0)	(587)	(41,895)	(587)
Natural Environment	(1,367)	(259,867)	(3)	(10)	(261,234)	(13)	(0)	(0)	(3)	(10)	(0)	(13)
Flood Control & Related Problems	71,855	52,213	92	1,449	124,068	1,541	18,996	41,693	189	3,145	60,689	3,334
Flood Control												
Principal Reaches	(31,450)	(5,650)	(92)	(0)	(37,100)	(92)	(8,500)	(1,700)	(189)	(0)	(10,200)	(189)
Upstream1/	(21,445)	(9,773)	(0)	(606)	(31,218)	(606)	(3,855)	(1,733)	(0)	(719)	(5,588)	(719)
Land Treatment	(3,011)	(29,942)	(0)	(0)	(32,953)	(0)	(3,399)	(30,183)	(0)	(0)	(33,582)	(0)
Sediment and Erosion												
Critical Land Treatment	(156)	(73)	(0)	(0)	(229)	(0)	(69)	(33)	(0)	(0)	(102)	(0)
Streambanks	(42)	(0)	(0)	(2)	(42)	(2)	(16)	(0)	(0)	(1)	(16)	(1)
Roadbanks	(243)	(131)	(0)	(11)	(374)	(11)	(213)	(115)	(0)	(20)	(328)	(20)
Drainage												
Watershed Management	(148)	(2,804)	(0)	(590)	(2,952)	(590)	(384)	(7,289)	(0)	(2,125)	(7,673)	(2,125)
Channels	(15,360)	(3,840)	(0)	(240)	(19,200)	(240)	(2,560)	(640)	(0)	(280)	(3,200)	(280)
Water Quality and Pollution	20,477	9,373	0	562	29,850	562	46,460	15,889	0	629	62,349	629
Municipal Waste Treatment	(20,477)	(6,826)	(0)	(116)	(27,303)	(116)	(46,460)	(15,486)	(0)	(88)	(61,946)	(88)
Bacteria Control	(0)	(2,547)	(0)	(446)	(2,547)	(446)	(0)	(403)	(0)	(541)	(403)	(541)
Navigation	16,470	3,010	340	0	19,480	340	72,500	19,790	2,450	0	92,290	2,450
Hydropower	0	0	0	0	0	0	0	0	0	0	0	0
Coastal and Estuarine	0	0	0	0	0	0	2,500	2,500	0	30	5,000	30
Historical and Archeological	1,181	1,181	0	0	2,362	0	6,652	6,653	0	0	13,305	0
Health	0	0	0	1,395	0	1,395	0	0	0	2,062	0	2,062
TOTALS	194,778	400,775	6,640	10,296	595,551	16,936	225,837	145,281	14,279	20,953	371,118	35,232

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

WRPA 9 (Cont'd)

Feature	2001-2020 Investment Federal	2001-2020 Investment Non-Federal	2001-2020 Annual O&M Federal	2001-2020 Annual O&M Non-Federal	2001-2020 Totals Investment	2001-2020 Totals O&M	Total Investment Cost ($1,000) Federal	Total Investment Cost ($1,000) Non-Federal	Total Investment Cost ($1,000) Total
Water Supply	37,299	11,163	1,553	7,161	48,462	8,714	66,392	20,284	86,676
Municipal	(6,048)	(6,048)	(0)	(1,834)	(12,096)	(1,834)	(10,710)	(10,710)	(21,420)
Irrigation	(26,268)	(132)	(0)	(3,775)	(26,400)	(3,775)	(46,354)	(246)	(46,600)
Fish and Wildlife	(4,983)	(4,983)	(1,553)	(1,552)	(9,966)	(3,105)	(9,328)	(9,328)	(18,656)
Water Surface	0	0	0	186	0	186	730	730	1,460
Recreation									
Small Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(0)	(0)	(0)	(80)	(0)	(80)	(200)	(200)	(400)
Fish and Wildlife	(0)	(0)	(0)	(106)	(0)	(106)	(530)	(530)	(1,060)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	80,690	80,690	17,263	18,540	161,380	35,803	214,391	464,591	678,982
Recreation	(50,800)	(50,800)	(17,260)	(17,260)	(101,600)	(34,520)	(152,850)	(152,850)	(305,700)
Fish and Wildlife	(29,890)	(29,890)	(0)	(1,270)	(59,780)	(1,270)	(60,174)	(51,874)	(112,048)
Natural Environment	(0)	(0)	(3)	(10)	(0)	(13)	(1,367)	(259,867)	(261,234)
Flood Control & Related Problems	14,048	44,950	307	5,813	58,998	5,620	104,899	138,856	243,755
Flood Control									
Principal Reaches	(9,700)	(2,480)	(307)	(0)	(12,180)	(307)	(49,650)	(9,830)	(59,480)
Upstream 1/	(0)	(0)	(0)	(719)	(0)	(719)	(25,300)	(11,506)	(36,806)
Land Treatment	(3,605)	(32,113)	(0)	(0)	(35,718)	(0)	(10,015)	(92,238)	(102,253)
Sediment and Erosion									
Critical Land Treatment	(30)	(15)	(0)	(0)	(45)	(0)	(255)	(121)	(376)
Streambanks	(21)	(0)	(0)	(1)	(21)	(1)	(79)	(0)	(79)
Roadbanks	(152)	(82)	(0)	(28)	(234)	(28)	(608)	(328)	(936)
Drainage									
Watershed Management	(540)	(10,260)	(0)	(4,285)	(10,800)	(4,285)	(1,072)	(20,353)	(21,425)
Channels	(0)	(0)	(0)	(280)	(0)	(280)	(17,920)	(4,480)	(22,400)
Water Quality and Pollution	26,900	9,505	0	732	36,405	732	93,837	34,767	128,604
Municipal Waste Treatment	(26,900)	(8,967)	(0)	(100)	(35,867)	(100)	(93,837)	(31,279)	(125,116)
Bacteria Control	(0)	(538)	(0)	(632)	(538)	(632)	(0)	(3,488)	(3,488)
Navigation	487,980	162,660	7,140	0	650,640	7,140	576,950	185,460	762,410
Hydropower	0	0	0	0	0	0	0	0	0
Coastal and Estuarine	7,500	7,500	0	80	15,000	80	10,000	10,000	20,000
Historical and Archeological	800	800	0	0	1,600	0	8,633	8,634	17,267
Health	0	0	0	2,189	0	2,189	0	0	0
TOTALS	655,217	317,268	26,263	34,201	972,485	60,464	1,075,832	863,322	1,939,154

Table 121 - Estimated Program Costs, National Income Objective (All costs in $1,000) Cont'd

	WRPA 10											
	1971-1980						1981-2000					
	Investment		Annual O&M		Totals		Investment		Annual O&M		Totals	
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M
Water Supply	5,941	5,941	0	1,579	11,882	1,579	21,187	21,186	8	5,627	42,373	5,635
Municipal	(5,941)	(5,941)	(0)	(1,579)	(11,882)	(1,579)	(21,179)	(21,179)	(0)	(5,620)	(42,358)	(5,620)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(0)	(0)	(0)	(0)	(0)	(0)	(8)	(7)	(8)	(7)	(15)	(15)
Water Surface	915	915	0	183	1,830	183	1,506	1,506	0	241	3,012	241
Recreation												
Small Water	(0)	(0)	(0)	(0)	(0)	(0)	(1,306)	(1,306)	(0)	(18)	(2,612)	(18)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(400)	(400)	(0)	(80)	(800)	(80)	(100)	(100)	(0)	(100)	(200)	(100)
Fish and Wildlife	(515)	(515)	(0)	(103)	(1,030)	(103)	(100)	(100)	(0)	(123)	(200)	(123)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	149,538	881,898	17,335	17,400	1,031,436	34,735	91,390	91,390	30,200	30,396	182,780	60,596
Recreation	(145,850)	(145,850)	(17,335)	(17,335)	(291,700)	(34,670)	(85,650)	(85,650)	(30,200)	(30,200)	(171,300)	(60,400)
Fish and Wildlife	(2,970)	(330)	(0)	(44)	(3,300)	(44)	(5,740)	(5,740)	(0)	(175)	(11,480)	(175)
Natural Environment	(718)	(735,718)	(0)	(21)	(736,436)	(21)	(0)	(0)	(0)	(21)	(0)	(21)
Flood Control & Related Problems	21,795	22,100	64	349	43,895	413	57,673	37,062	412	694	94,735	1,106
Flood Control												
Principal Reaches	(12,360)	(5,640)	(64)	(141)	(18,000)	(205)	(49,600)	(20,000)	(412)	(141)	(69,600)	(553)
Upstream1/	(3,718)	(1,893)	(0)	(59)	(5,611)	(59)	(4,506)	(1,784)	(0)	(143)	(6,290)	(143)
Land Treatment	(1,196)	(13,050)	(0)	(0)	(14,246)	(0)	(1,128)	(13,604)	(0)	(0)	(14,732)	(0)
Sediment and Erosion												
Critical Land Treatment	(73)	(36)	(0)	(0)	(109)	(0)	(19)	(10)	(0)	(0)	(29)	(0)
Streambank	(91)	(1)	(0)	(5)	(92)	(5)	(45)	(1)	(0)	(7)	(46)	(7)
Roadbanks	(16)	(8)	(0)	(1)	(24)	(1)	(14)	(7)	(0)	(1)	(21)	(1)
Drainage												
Watershed Management	(21)	(392)	(0)	(83)	(413)	(83)	(57)	(1,080)	(0)	(310)	(1,137)	(310)
Channels	(4,320)	(1,080)	(0)	(60)	(5,400)	(60)	(2,304)	(576)	(0)	(92)	(2,880)	(92)
Water Quality and Pollution	47,252	18,945	0	638	66,197	638	122,879	41,419	0	728	164,298	728
Municipal Waste Treatment	(47,252)	(15,750)	(0)	(53)	(63,002)	(53)	(122,879)	(40,960)	(0)	(73)	(163,839)	(73)
Bacteria Control	(0)	(3,195)	(0)	(585)	(3,195)	(585)	(0)	(459)	(0)	(655)	(459)	(655)
Navigation	139,540	64,650	2,030	0	204,190	2,030	41,680	6,890	2,420	0	48,570	2,420
Hydropower	0	0	0	0	0	0	0	0	0	0	0	0
Coastal and Estuarine	3,900	1,900	0	36	5,800	36	8,000	8,000	0	136	16,000	136
Historical and Archeological	748	748	0	0	1,496	0	3,596	3,597	0	0	7,193	0
Health	0	0	0	550	0	550	0	0	0	840	0	840
TOTALS	369,629	997,097	19,429	20,735	1,366,726	40,164	347,911	211,050	33,040	38,662	558,961	72,702

Table 121 - Estimated Program Costs, National Income Objective (All Costs in $1,000) Cont'd

WRPA 10

Feature	2001-2020 Investment Federal	2001-2020 Investment Non-Federal	2001-2020 Annual O&M Federal	2001-2020 Annual O&M Non-Federal	2001-2020 Totals Investment	2001-2020 Totals O&M	Total Investment Costs ($1,000) Federal	Total Investment Costs ($1,000) Non-Federal	Total Investment Costs ($1,000) Total
Water Supply	41,104	41,104	11	10,920	82,208	10,931	68,232	68,231	136,463
Municipal	(41,093)	(41,093)	(0)	(10,909)	(82,186)	(10,909)	(68,213)	(68,213)	(136,426)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Fish and Wildlife	(11)	(11)	(11)	(11)	(22)	(22)	(19)	(18)	(37)
Water Surface	200	200	0	281	400	281	2,621	2,621	5,242
Recreation									
Small Water	(0)	(0)	(0)	(18)	(0)	(18)	(1,306)	(1,306)	(2,612)
Large Water	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Stream Access	(100)	(100)	(0)	(120)	(200)	(120)	(600)	(600)	(1,200)
Fish and Wildlife	(100)	(100)	(0)	(143)	(200)	(143)	(715)	(715)	(1,430)
Natural Environment	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lands	155,348	155,347	50,118	50,500	310,695	100,618	396,276	1,128,635	1,524,911
Recreation	(147,175)	(147,175)	(50,118)	(50,117)	(294,350)	(100,235)	(378,675)	(378,675)	(757,350)
Fish and Wildlife	(8,173)	(8,172)	(0)	(362)	(16,345)	(362)	(16,883)	(14,242)	(31,125)
Natural Environment	(0)	(0)	(0)	(21)	(0)	(21)	(718)	(735,718)	(736,436)
Flood Control & Related Problems	20,123	20,075	576	1,028	40,198	1,604	99,591	79,237	178,828
Flood Control									
Principal Reaches	(18,400)	(6,200)	(576)	(141)	(24,600)	(717)	(80,360)	(31,840)	(112,200)
Upstream[1]	(0)	(0)	(0)	(143)	(0)	(143)	(8,224)	(3,677)	(11,901)
Land Treatment	(1,014)	(12,224)	(0)	(0)	(13,238)	(0)	(3,338)	(38,878)	(42,216)
Sediment and Erosion									
Critical Land Treatment	(0)	(0)	(0)	(0)	(0)	(0)	(92)	(46)	(138)
Streambank	(45)	(1)	(0)	(9)	(46)	(9)	(181)	(3)	(184)
Roadbanks	(9)	(5)	(0)	(2)	(14)	(2)	(39)	(20)	(59)
Drainage									
Watershed Management	(79)	(1,501)	(0)	(626)	(1,580)	(626)	(157)	(2,973)	(3,130)
Channels	(576)	(144)	(0)	(107)	(720)	(107)	(7,200)	(1,800)	(9,000)
Water Quality and Pollution	76,621	26,541	0	937	103,162	937	246,752	86,905	333,657
Municipal Waste Treatment	(76,621)	(25,540)	(0)	(97)	(102,161)	(97)	(246,752)	(82,250)	(329,002)
Bacteria Control	(0)	(1,001)	(0)	(840)	(1,001)	(840)	(0)	(4,655)	(4,655)
Navigation	13,540	710	2,590	0	14,250	2,590	194,760	72,250	267,010
Hydropower	0	0	0	0	0	0	0	0	0
Coastal and Estuarine	112,500	112,500	0	1,636	225,000	1,636	124,400	122,400	246,800
Historical and Archeological	800	800	0	0	1,600	0	5,144	5,145	10,289
Health	0	0	0	914	0	914	0	0	0
TOTALS	420,236	357,277	53,295	66,216	777,513	119,511	1,137,776	1,565,424	2,703,200

major problem area components. All costs represent the most current available data applicable to the study area expressed in January 1972 dollars and have not been adjusted or discounted by time periods. Totals represent either a summation of the costs of the cheapest combination of alternative measures which best satisfy background needs or the cost of the most pragmatic solution to a problem. As explained in "Methodology," estimating procedures involved many generalizations and judgmental approximations and are intended to indicate order of magnitude costs only.

An indication of the Federal and non-Federal share of costs summarized by each of the Study's three time frames in terms of total investment and annual O&M is also included. O&M costs are cumulative and represent the annual amount at the last year of each time span, whereas investments are in terms of incremental amounts and are therefore additive over the 50-year period of study. Table 122 lists the approximate Federal cost sharing percentages used in arriving at the allocation to Federal and non-Federal interests. The percentages are based on information presently available and judgment, and may vary in the future. All categories are not included in the listing because an across-the-board cost-sharing criterion applied to a summation of costed measures, each having a unique Federal-non-Federal cost relationship as in navigation, is meaningless.

Table 122 - Federal Cost Sharing Percentages, Lower Mississippi Region

Program Component	Federal Cost Sharing (Percent)
Municipal Water Supply	50
Municipal Waste Treatment	75
Recreation - Small Water Areas	50
Recreation - Large Water Areas	75
Sediment and Erosion	
Roadbanks	65
Streambanks	99+
Coastal and Estuarine	50
Land Treatment	67
Drainage - Channels	80
Hydropower	100
Flood Control	
Principal Streams	90
Upstream Reaches	80
Archeology and History	50
Health Aspects	50
Irrigation (WRPA 2 only)	40
Environmental	27

It is important to recognize that the funding schedule presented in the next major section deals not only with new investments, but also with total investment requirements which take into account ongoing agency programs as defined above.

Total Program Costs

Realization of the total program to 1980 will cost the Federal Government \$2.8 billion and non-Federal public entities an additional \$3.9 billion. Annual operation and maintenance costs will amount to \$65 million Federal and \$87 million non-Federal.

By far the most expensive component of the program relates to provision of land and water areas for environmental quality purposes. Satisfaction of this need requires that certain land areas, through purchase or other means, remain in their present state. It further requires that some lands provide sites for creation of water areas or open and green space in juxtaposition to urban centers. Provision of these areas will require a total short-term investment of over \$2.4 billion (mostly non-Federal public costs). Delay of this investment beyond 1980 is not recommended because the irreversible loss of environmental items could occur at any time during the study period. Annual operation and maintenance costs, nearly all non-Federal, would average \$309,000.

Flood control and solution of related problems, with the exception of water quality, will cost \$1.6 billion to 1980, an additional \$1.1 billion to the year 2000, and another \$0.9 billion to the year 2020, amounting to a total 50-year cost of \$3.7 billion, with a regional average split of roughly 50 percent Federal and 50 percent non-Federal. Non-Federal public interests will bear the brunt (nearly 80 percent) of the operation and maintenance cost for works aimed at problem solutions with annual charges increasing from \$16.4 million per year to 1980 to \$33 million per year in 2000 and \$51.9 million per year in 2020. Flood control will require the greatest outlay of capital with a total 50-year cost of nearly \$1.1 billion on the region's principal streams and an additional \$554 million in upstream watersheds. Almost as much money will be required to solve regional problems by utilizing land treatment as a measure in the solution of flood control, sediment and erosion, and drainage problems. This measure will require a budget of nearly \$1.6 billion over the next 50 years.

Significant costs must also be borne if regional navigation needs are to be met as programmed. Over the next 50 years, improvement of the region's shallow and deep draft navigation channels, harbors, and locks will cost \$1.6 billion (\$1.3 billion Federal and \$0.3 billion non-Federal) with nearly half of the bill due in the Study's first time span. An additional \$13.8 million, nearly all Federal cost, will be required annually to 1980 for operation and maintenance of the new navigation works. This cost will increase steadily to \$17.5 million per year in 2000 and to \$23.1 million in 2020.

Water quality and pollution costs to be borne in the public sector for conventional municipal waste treatment and bacteria control will amount to $245 million to 1980, an additional $607 million to the year 2000, and another $409 million between 2000 and 2020 for a total investment of nearly $1.3 billion for the 50-year period of study. Seventy-five percent of all municipal treatment costs will be borne by the Federal Government, while the total cost for bacterial control is charged to non-Federal interests.

Costs for elimination of the region's water quality problems from pollutants other than biodegradable wastes are of substantially greater magnitude than are the public sector costs herein displayed for conventional waste treatment for control of 5-day BOD and bacteria. In 1970 the estimated regional cost of installation of treatment works with the capability to satisfactorily ameliorate the non-BOD_5 problem was in excess of $1.5 billion. Works needed included collecting sewers, separation of sanitary and storm sewers, industrial pollutants (including inorganic chemicals), industrial cooling, sediment, and other natural pollutants. Operation and maintenance of these works was estimated at an additional $0.6 million yearly. Substantial increases in these costs are to be expected, especially operation and maintenance costs, as the region becomes more highly industrialized in the future. These estimations, though gross approximations, serve to illustrate the pressing need to (1) satisfactorily define the full range of pollutants, present or future, in the region's waters, and (2) design the proper regional scheme of control and prevention of all pollutants.

Provision of water and land areas and facilities development for recreation and fish and wildlife purposes will require an outlay of $4.2 billion over the 50-year time span of the study. In excess of $2.6 billion of the total represents the cost of purchasing Class A recreation areas in urban centers.

Satisfaction of needs in the coastal and estuarine zone primarily by the utilization of flows diverted by economically feasible means from the Mississippi River below New Orleans, Louisiana, will cost nearly $267 million for the period of study. The bulk of this cost will manifest itself during the 2001 to 2020 time period.

Less significant program costs will accrue as the result of providing water supplies for municipal, irrigation, and fish and wildlife purposes ($419 million to 2020), for hydropower development ($140 million to 2020), archeological and historical aspects ($211 million to 2020), and a lesser amount for health aspects considerations.

Costs for studies and data gathering were not estimated even though an impressive array of needs for studies were quantified. It is expected that a continuation of ongoing agency and State budget appropriations will be sufficient to defray the cost of studies, while special grant funds will aid in research and compilation of additional needed planning data.

REGIONAL DEVELOPMENT PROGRAM

Capital investments in water and related land resource facilities not only contribute to the National Income objective, but also can promote the regional economy by helping to provide a more diversified regional economic base, increased regional income and employment, and improved income distribution and quality of services within the region. The extent to which such investments or other measures might serve as inducements to regional development has not been evaluated for this study, nor have specific action plans been formulated for stimulating the regional economy. However, an attempt has been made to develop a program (Program B) and component plans responsive to conditions that might prevail should the short-term regional economy be accelerated to a growth rate equal to the national average, with equivalent long-range sustainment.

The plans that follow are directed to satisfaction of the designated Program B needs summarized in the previous section of this appendix. Because of their similarity to the National Income plans, only abbreviated information is presented here in the interest of avoiding unnecessary repetition. The lack of formulated action plans for stimulating regional development is a result of realigning some of the study's initial planning concepts outdated by the "Principles and Standards" adopted by the Water Resources Council in late 1973.

Resource Use and Problem Amelioration

Water Withdrawals

Priorities for water use and withdrawals under regional development objectives would parallel those of the National Income Program, except that quantities would be larger in all planning areas in all time frames. The measures used to meet withdrawal needs under the National Income Program could be increased in scale to meet the regional development needs. The type and magnitude of the withdrawals required for regional development are given in table 123.

Water Surface Area

Problems facing the region in fulfilling National Income objective needs for water surface areas would be compounded under a regional development program. By comparing the information in table 124 with that in table 91, it can be seen that regional development needs for the year 2020 exceed the National Income needs by almost 750,000 acres. The needs for small water areas could be fulfilled through intensive resource development, using the same type measures employed for the National Income Program. Those for large water areas could not be met in WRPA's 2, 3, 4, or 6 because of the limited development potential in those areas (see table 90). Table 125 summarizes the extent to which water surface areas could be developed to satisfy as much as possible of the regional development needs.

Table 123 - Water Withdrawal Plan, Program B, Lower Mississippi Region 1/

WRPA/Time Frame		MUNICIPAL Ground Fresh	MUNICIPAL Surface Fresh Stream	MUNICIPAL Surface Storage	INDUSTRIAL Ground Fresh	INDUSTRIAL Ground Brackish	INDUSTRIAL Surface Fresh Stream	INDUSTRIAL Surface Brackish Stream	INDUSTRIAL Surface Storage	INDUSTRIAL Surface Inter-Region Transfer 2/	INDUSTRIAL Surface Intra-Region Transfer 2/	RURAL DOMESTIC Ground Fresh	THERMOELECTRIC Ground Fresh	THERMOELECTRIC Ground Brackish
WRPA 2	1970	34.8	0	0	38.8	0	0	0	0	0	0	24.7	5.0	0
	1980	43.2	0	0	64.0	0	0	0	0	0	0	22.3	5.0	0
	2000	63.4	0	0	164.8	0	0	0	0	0	0	17.7	5.0	0
	2020	96.2	0	0	391.2	0	0	0	0	0	0	12.2	5.0	0
WRPA 3	1970	141.8	0	0	98.0	0	0	0	0	0	0	19.3	0	0
	1980	192.9	0	0	163.8	0	0	0	0	0	0	22.0	0	0
	2000	316.0	0	0	398.1	0	0	0	0	0	0	16.2	0	0
	2020	474.5	0	0	761.4	0	182.9	0	0	0	0	13.9	0	0
WRPA 4	1970	53.8	0	0	49.1	0	37.5	0	0	0	0	21.7	25.0	0
	1980	71.9	0	0	81.3	0	67.3	0	0	0	0	20.6	25.0	0
	2000	101.8	0	0	200.7	0	169.9	0	0	0	0	16.7	25.0	0
	2020	140.4	0	0	401.9	0	457.8	0	0	0	0	12.6	25.0	0
WRPA 5	1970	37.5	16.8	0	119.3	0	87.4	0	0	0	0	16.1	0.3	0
	1980	46.1	17.6	6.3	163.3	0	87.4	0	95.2	0	0	15.3	0.3	0
	2000	64.7	26.1	11.1	417.0	0	257.6	0	133.9	0	0	13.9	17.1	0
	2020	96.9	39.5	15.8	882.5	0	748.4	0	172.6	0	0	6.3	22.5	0
WRPA 6	1970	7.5	0.6	0	28.4	0	33.1	0	0	0	0	6.7	0	0
	1980	9.1	0.7	0	37.0	0	41.9	0	0	0	0	5.6	0	0
	2000	11.0	0.9	0	73.6	0	83.6	0	0	0	0	4.0	0	0
	2020	15.0	1.2	0	143.8	0	163.0	0	0	0	0	2.9	0	0
WRPA 7	1970	12.0	0	0	73.1	0	0.5	0	0	0	0	5.2	0	0
	1980	17.0	0	0	114.0	0	0.9	0	0	0	0	5.1	0	0
	2000	25.7	0	0	169.4	0	93.6	0	0	0	0	4.0	0	0
	2020	38.3	0	0	169.4	0	405.7	0	0	0	0	2.2	0	0
WRPA 8	1970	54.3	1.0	0	159.0	3.0	1,352.2	0	0	0	0	4.5	1.0	8.0
	1980	76.7	1.0	0	539.0	5.0	1,936.1	0	0	0	0	5.3	1.0	18.0
	2000	120.5	1.0	0	701.0	15.0	5,832.8	0	0	0	0	6.9	1.0	68.0
	2020	177.8	1.0	0	756.0	38.0	15,528.3	0	0	0	0	9.5	1.0	81.0
WRPA 9	1970	65.0	6.9	0	238.0	0	39.0	1,024.3	0	0	0	16.8	9.0	0
	1980	91.3	6.9	0	325.0	745.0	150.6	1,024.3	0	0	0	16.1	9.0	0
	2000	136.0	6.9	0	604.0	3,319.0	154.2	1,024.3	0	385.0	0	16.7	9.0	0
	2020	182.1	6.9	0	1,164.0	9,062.0	167.0	1,024.3	43.0	450.0	804.0 3/	16.5	9.0	0
WRPA 10	1970	5.7	179.0	0	26.0	0	1,981.7	31.0	0	0	0	3.5	21.0	0
	1980	8.8	229.0	0	302.0	20.0	3,014.1	31.0	0	0	0	5.8	21.0	83.0
	2000	15.9	330.0	0	302.0	106.0	8,476.0	31.0	0	0	0	7.0	21.0	448.0
	2020	22.9	463.0	0	302.0	305.0	21,093.4	31.0	0	0	0	5.7	21.0	580.0
REGION	1970	412.4	204.3	0.0	829.7	3.0	3,531.4	1,055.3	0	0	0	118.5	61.3	8.0
	1980	557.0	255.2	6.3	1,789.4	770.0	5,298.3	1,055.3	95.2	0	0	118.1	61.3	101.0
	2000	855.0	364.9	11.1	3,030.6	3,440.0	15,067.7	1,055.3	133.9	385.0	0	103.1	78.1	516.0
	2020	1,244.1	511.6	15.8	4,972.2	9,405.0	38,746.5	1,055.3	215.6	450.0	804.0	81.8	83.5	661.0

1/ All withdrawals are in mgd.
2/ Measure includes any required surface storage.
3/ Intra-Region Transfer does not include use of Mississippi River water by adjacent WRPA's (included under the category "Fresh Stream")

Table 123 - Water Withdrawal Plan, Program B, Lower Mississippi Region (cont'd)

WRPA/Time Frame		THERMOELECTRIC Surface Fresh Stream	THERMOELECTRIC Surface Brackish Stream	THERMOELECTRIC Intra-Region Transfer	IRRIGATION Ground Fresh	IRRIGATION Surface Fresh Stream	IRRIGATION Surface Storage	IRRIGATION Intra-Region Transfer	OTHER AGRICULTURAL Ground Fresh	OTHER AGRICULTURAL Surface Fresh Stream	COMMERCIAL FISHERIES Ground Fresh	COMMERCIAL FISHERIES Surface Fresh Stream	MINERALS Ground Fresh	MINERALS Ground Brackish	MINERALS Surface Fresh Stream
WRPA 2	1970	394.0	0	0	2,114.0	271.3	101.8	0	2.0	3.3	40.0	59.9	4.0	0	0
	1980	394.0	0	0	1,971.0	400.8	233.0	0	4.7	2.0	52.0	78.0	5.7	0	0
	2000	713.5	0	0	2,003.6	414.2	259.8	350.0 4/	5.4	3.3	75.0	113.0	5.7	0	0.4
	2020	884.0	0	0	2,307.3	424.1	259.8	350.0 4/	3.7	7.2	40.0	207.0	5.7	0	0.8
WRPA 3	1970	430.0	0	0	4.3	24.4	0	0	2.0	6.3	3.7	0	0.7	0	0
	1980	633.6	0	0	73.6	0	0	0	10.0	0	6.6	0	1.0	0	0
	2000	1,780.0	0	0	93.4	0	0	0	10.7	3.6	12.4	0	1.6	0	0
	2020	2,700.5	0	0	28.7	85.7	0	0	12.4	6.6	18.1	0	0.7	0	1.6
WRPA 4	1970	280.0	0	0	171.7	124.3	0	0	3.4	5.2	56.5	14.1	0.3	0	0.8
	1980	970.2	0	0	222.7	161.3	0	0	4.1	6.6	98.8	24.8	0.3	0	0.9
	2000	1,020.4	0	0	267.2	193.6	0	0	6.0	9.0	183.8	46.0	0.3	0	1.2
	2020	1,232.9	0	0	301.3	218.1	0	0	7.9	12.1	268.8	67.2	0.5	0	1.5
WRPA 5	1970	1,070.7	0	0	245.0	120.6	0	0	3.7	3.7	15.7	6.7	45.5	0	9.5
	1980	1,070.7	0	0	296.0	141.0	0	0	3.5	5.6	28.5	12.3	76.6	0	14.8
	2000	3,277.4	0	0	374.3	175.4	0	0	5.1	8.0	54.7	23.1	97.4	0	19.3
	2020	3,894.0	0	0	422.1	199.9	0	0	7.5	10.0	83.1	35.5	119.6	0	24.5
WRPA 6	1970	0.3	0	0	116.0	36.6	0	0	2.6	1.1	6.1	2.6	6.3	0	0.8
	1980	97.1	0	0	148.0	47.3	0	0	1.8	2.8	17.2	7.4	7.6	0	1.0
	2000	575.1	0	0	168.5	54.1	0	0	2.3	4.3	39.4	16.9	13.2	0	1.6
	2020	713.5	0	0	192.8	62.1	0	0	3.2	5.6	61.7	26.4	18.9	0	2.4
WRPA 7	1970	1.0	0	0	2.2	3.2	0	0	1.4	2.2	4.5	1.1	3.2	0	0.5
	1980	73.6	0	0	14.2	2.4	0	0	1.8	2.7	7.5	1.9	4.4	0	0.7
	2000	462.8	0	0	17.6	2.7	0	0	2.6	3.8	13.5	3.4	6.9	0	1.0
	2020	554.1	0	0	20.8	3.1	0	0	3.8	4.7	19.5	4.9	9.5	0	1.4
WRPA 8	1970	579.4	0	0	1.2	0.3	0	0	2.2	2.8	1.0	0.9	0	12.0	15.8
	1980	1,377.1	0	0	1.5	12.6	0	0	5.0	0.8	1.0	3.4	0	18.0	26.9
	2000	5,247.8	0	0	1.5	16.2	0	0	5.0	3.2	1.0	8.4	0	32.0	61.0
	2020	6,312.7	0	0	1.5	20.3	0	0	5.0	5.8	1.0	13.4	0	47.0	100.5
WRPA 9	1970	327.5	0	0	713.6	773.0	0	0	2.4	4.4	33.8	33.0	0	0	18.0
	1980	371.5	0	337.8 4/	982.0	177.6	0	28.0	8.2	0	52.8	33.0	0	148.7	18.0
	2000	371.5	0	2,476.3 4/	752.0	177.9	0	438.0	11.8	0	90.8	33.0	0	429.8	18.0
	2020	371.5	0	3,201.8 4/	713.0	177.6	0	593.0	15.6	0	128.7	33.0	0	729.0	18.0
WRPA 10	1970	1,241.4	144.0	0	2.0	2.4	0	0	0.3	0.6	3.0	4.5	0	0	48.0
	1980	1,994.0	144.0	0	1.4	6.5	0	0	0	1.1	3.0	7.4	0	185.2	98.0
	2000	5,168.1	144.0	0	1.4	14.1	0	0	0	1.6	3.0	13.1	0	560.7	184.0
	2020	6,325.1	144.0	0	1.4	21.3	0	0	0	2.1	3.0	18.9	0	1,029.1	270.0
Region	1970	4,324.3	144.0	0	3,370.0	1,356.1	101.8	0	20.0	29.6	164.3	122.8	60.0	12.0	93.4
	1980	6,981.8	144.0	337.8	3,710.6	949.5	233.0	28.0	39.1	21.6	267.4	168.2	95.6	351.9	160.3
	2000	18,616.6	144.0	2,476.3	3,679.5	1,048.2	259.8	783.0	48.9	36.8	473.6	256.9	125.1	1,022.5	286.5
	2020	22,988.3	144.0	3,201.8	3,988.9	1,212.2	259.8	943.0	59.1	54.1	623.9	406.3	154.9	1,805.1	420.7

Table 123 - Water Withdrawal Plan, Program B, Lower Mississippi Region (cont'd)

WRPA/Time Frame		MINERALS		FISH & WILDLIFE				TOTALS						
		Surface		Ground	Surface			Ground		Surface				
		Brackish Stream	Storage	Fresh	Fresh Stream	Storage	Intra-Region Transfer	Fresh	Brackish	Fresh Stream	Brackish Stream	Storage	Inter-Region Transfer	Intra-Region Transfer
2	1970	0	0	435.0	145.0	0	0	2,698.3	0	873.5	0	101.8	0	0
	1980	0	0	434.2	195.8	0	0	2,602.3	0	1,070.6	0	233.0	0	0
	2000	0	0	293.8	446.2	0	0	2,634.4	0	1,690.6	0	259.8	0	350.0
	2020	0	0	40.3	682.6	127.1	0	2,901.6	0	2,205.7	0	386.9	0	350.0
3	1970	0	0	25.0	8.0	0	0	294.8	0	468.7	0	0	0	0
	1980	0	0	68.0	8.0	0	0	537.9	0	641.6	0	0	0	0
	2000	0	0	149.0	13.0	0	0	997.4	0	1,796.6	0	0	0	0
	2020	0	0	147.5	100.5	0	0	1,457.2	0	2,677.8	0	0	0	0
4	1970	0	0	15.5	15.5	0	0	397.0	0	477.4	0	0	0	0
	1980	0	0	26.5	26.5	0	0	551.2	0	1,257.6	0	0	0	0
	2000	0	0	41.5	41.5	0	0	843.0	0	1,481.6	0	0	0	0
	2020	0	0	58.5	58.5	0	0	1,216.9	0	2,048.1	0	0	0	0
5	1970	0	0	12.7	241.3	0	0	495.8	0	1,556.7	0	0	0	0
	1980	0	0	14.2	270.8	0	0	643.8	0	1,620.2	0	101.5	0	0
	2000	0	0	17.2	327.8	0	0	1,061.4	0	4,114.7	0	145.0	0	0
	2020	0	0	20.2	386.8	0	0	1,660.7	0	5,338.6	0	188.4	0	0
6	1970	0	0	3.4	63.6	0	0	177.0	0	138.7	0	0	0	0
	1980	0	0	3.8	71.2	0	0	230.1	0	269.4	0	0	0	0
	2000	0	0	4.8	86.2	0	0	316.8	0	822.7	0	0	0	0
	2020	0	0	5.5	102.5	0	0	443.8	0	1,076.7	0	0	0	0
7	1970	0	0	2.5	2.5	0	0	104.1	0	11.0	0	0	0	0
	1980	0	0	3.5	3.5	0	0	167.5	0	85.3	0	0	0	0
	2000	0	0	6.5	6.5	0	0	246.2	0	573.8	0	0	0	0
	2020	0	0	9.0	9.0	0	0	272.5	0	982.9	0	0	0	0
8	1970	0	0	1.0	2.0	0	0	224.2	23.0	1,954.4	0	0	0	0
	1980	0	0	1.0	4.0	0	0	630.5	41.0	3,361.9	0	0	0	0
	2000	0	0	1.0	7.0	0	0	837.9	115.0	11,177.4	0	0	0	0
	2020	0	0	1.0	11.0	0	0	952.8	166.0	21,993.0	0	0	0	0
9	1970	254.0	0	121.0	363.0	0	0	1,197.6	0	1,564.8	1,278.3	0	0	0
	1980	254.0	13.0	194.0	363.0	0	0	1,678.4	893.7	1,120.6	1,278.3	13.0	0	365.8
	2000	254.0	52.0	382.0	363.0	0	0	2,002.3	3,748.8	1,124.5	1,278.3	52.0	385.0	2,914.3
	2020	254.0	96.1	379.0	363.0	0	123.0	2,607.9	9,791.0	1,137.0	1,278.3	139.1	450.0	4,721.8
10	1970	182.9	0	2.0	1,843.0	0	0	63.5	0	5,300.6	357.9	0	0	0
	1980	182.9	0	2.0	1,843.0	0	0	344.0	288.2	7,193.1	357.9	0	0	0
	2000	182.9	0	2.0	1,845.0	0	0	352.3	1,114.7	16,031.9	357.9	0	0	0
	2020	182.9	0	2.0	1,846.0	0	0	358.0	1,914.1	30,039.8	357.9	0	0	0
Region	1970	436.9	0	618.1	2,683.9	0	0	5,654.3	23.0	12,345.8	1,636.2	101.8	0	0
	1980	436.9	13.0	747.2	2,785.8	0	0	7,385.7	1,222.9	16,620.7	1,636.2	347.5	0	365.8
	2000	436.9	52.0	897.8	3,136.2	0	0	9,291.7	4,978.5	38,813.3	1,636.2	456.8	385.0	3,264.3
	2020	436.9	96.1	663.0	3,559.9	127.1	123.0	11,871.4	11,871.1	67,499.6	1,636.2	714.4	450.0	5,071.8

Table 124 - Summary Analysis of Net Needs for Man-Made Water Surface, RD Objective, Lower Mississippi Region

Planning Area/Time		Net Needs (1,000 Acres)												
		Recreation		Fish & Wildlife		Water Surface by-Product of Storage Requirements						Largest Remaining Net Need Sum of By-Products		
						Large Lakes				Small Lakes				
		Large Lakes	Small Lakes	Lakes	Ponds1/	Flood Control	Navigation	Power	Water Supply	Flood Control	Environmental Quality5/	Large Lakes	Small Lakes	Total
WRPA 2	1980	0	0	0	0	0	0	0	0 4/	23	10	0	33	33
	2000	35	40	0	0	0	0	14	0 4/	23	10	35	40	75
	2020	83	99	0	0	0	0	14	0 4/	24	10	83	99	182
WRPA 3	1980	81	131	6	0	2	0	0	0	44	0	81	131	212
	2000	189	275	17	0	2	0	0	0	65	0	189	275	464
	2020	373	511	32	0	2	0	0	0	82	0	373	511	884
WRPA 4	1980	0	35	0	0	0	(14) 2/	14	0	6	0	14	35	49
	2000	17	88	0	0	0	(14) 2/	14	0	8	0	17	88	105
	2020	64	146	0	0	0	(14) 2/	14	0	10	0	64	146	210
WRPA 5	1980	0	0	0	0	26	0	0	0	32	0	26	32	58
	2000	0	0	0	0	50	0	(20) 3/	(14) 3/	34	0	50	34	80
	2020	0	230	0	0	50	0	(20) 3/	(14) 3/	46	0	50	230	276
WRPA 6	1980	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	0	3	0	0	0	0	0	0	0	0	0	3	3
	2020	7	15	0	0	0	0	0	0	0	0	7	15	22
WRPA 7	1980	0	0	0	0	0	0	0	0	55	0	0	55	55
	2000	0	11	0	0	0	0	88	0	70	0	88	70	158
	2020	0	29	0	0	0	0	88	0	70	0	88	70	158
WRPA 8	1980	0	0	0	0	0	0	0	0	15	0	0	15	15
	2000	0	0	0	0	0	0	0	0	37	0	0	37	37
	2020	0	155	0	0	0	0	0	0	42	0	0	155	155
WRPA 9	1980	0	0	0	0	0	0	0	17	0	0	7	0	7
	2000	0	0	0	0	0	0	0	80	0	0	80	0	80
	2020	0	0	0	0	0	0	0	140	0	0	140	0	140
WRPA 10	1980	0	0	0	0	0	0	0	2	0	0	2	0	2
	2000	0	0	0	0	0	0	0	14	2	0	14	2	16
	2020	0	0	0	0	0	0	0	14	2	0	14	2	16
LMR	1980	81	166	6	0	28	(14)	14	9	175	10	130	301	431
	2000	241	417	17	0	52	(14)	116(20)	108	239	10	475	549	1,022
	2020	527	1,185	32	0	52	(14)	116(20)	168	276	10	819	1,228	2,047

1/ Pond resource more than adequate in all WRPA's, however, public does not have access to 90% of the needed pond areas.
2/ Included in power pool (multi-use with power production).
3/ Included in FC pool water surface.
4/ There will be private storage development in WRPA 2 for irrigation purposes but no identified water surface data available.
5/ No conflict between EQ&RD exists in this case, therefore included in RD Program.

Table 125 - Water Surface Area Plan, RD Objective, Lower Mississippi Region

WRPA/Time Frame		Large Water (1,000 Acres): Large Lakes[1/]			Small Lakes[2/]			Total Large Water	Small Water (1,000 Acres)[3/]			Ponds (1,000 Acres)[4/]			Total Water
		Existing[5/]	Proposed Addition	Subtotal	Existing[5/]	Proposed Addition	Subtotal		Existing[5/]	Proposed Addition	Subtotal	Existing[5/]	Proposed Addition	Subtotal	
2	1980	22	0	22	69	33	102	124	98	0	98	52	0	52	274
	2000		14[6/]	36		7	109	145		0	98		0	52	288
	2020		0	36		59[6/]	168	204		0	98		0	52	327
3	1980	4	81	85	36	131	167	252	32	0	32	104	0	104	361
	2000		77[6/]	162		144	311	473		0	32		0	104	567
	2020		0	162		236[6/]	547	709		0	32		0	104	757
4	1980	49	14[6/]	63	25	35	60	123	133	0	133	54	0	54	289
	2000		0	63		53	113	176		0	133		0	54	358
	2020		0	63		58[6/]	171	234		0	133		0	54	398
5	1980	175	26	201	0	32	32	233	76	0	76	68	0	68	377
	2000		24[6/]	225		2	34	259		0	76		0	68	403
	2020		0	225		196[6/]	230	455		0	76		0	68	475
6	1980	10	0[6/]	10	22	0	22	32	40	0	40	16	0	16	88
	2000		0	10		3	25	35		0	40		0	16	90
	2020		0	10		12[6/]	37	47		0	40		0	16	100
7	1980	23	0	23	15	55	70	93	56	0	56	14	0	14	163
	2000		88[6/]	111		15[6/]	85	196		0	56		0	14	266
	2020		0	111		0	85	196		0	56		0	14	266
8	1980	51	0[6/]	51	22	15	37	88	45	0	45	46	0	46	179
	2000		0	51		22	59	110		0	45		0	46	201
	2020		0	51		118[6/]	177	228		0	45		0	46	242
9	1980	316	7	323	84	0[6/]	84	407	138	0	138	62	0	62	602
	2000		73	396		0	84	480		0	138		0	62	638
	2020		60	456		0	84	540		0	138		0	62	688
10	1980	432	2	434	507	0	507	941	219	0	219	117	0	117	1,275
	2000		12	446		2[6/]	509	955		0	219		0	117	1,278
	2020		0	446		0	509	955		0	219		0	117	1,285
LMR	1980	1,082	130	1,212	780	301	1,081	2,661[7/]	837	0	837	533	0	533	3,976[7/]
	2000		288	1,500		248	1,329	3,197[7/]		0	837		0	533	4,457[7/]
	2020		60	1,560		679	2,008	3,936[7/]		0	837		0	533	4,906[7/]

1/ Lakes covering more than 500 acres.
2/ Lakes between 40 and 499 acres.
3/ Water surface areas between 2 and 39 acres in size.
4/ Water surface areas less than 2 acres in size. Counted as land area and included in the "other" category of land use.
5/ Natural water bodies and man-made water bodies (reservoirs and ponds) in place or under construction as of 1 July 1973.
6/ Proposed addition limited by development potential of WRPA.
7/ Includes 368,000 acres in Mississippi River (WRPA 1).

Land Areas

A regional composite of present land use and feasible future use for satisfying as much as possible of the regional development needs through the year 2020 is given in table 126. The given allocation would permit the satisfaction of all regional development needs for open land, but regional development needs for timber production and fish and wildlife habitat would not be met with the forest land that would be retained. Conversely, retention of the needed forest lands would preclude satisfaction of the open land needs. Obviously, then, the constraint imposed by limited resources would deter achievement of the study's Regional Development objective, and it seems reasonable to expect that the economical growth of the region will continue at a rate somewhat less than the national average.

Plans

Plans developed for recreation, fish and wildlife, environmental quality, and for problem amelioration under the study's Regional Development objective are summarized in the nine tables that follow, bearing in mind the absence of an explicit Regional Development objective in the Council's latest "Principles and Standards for Planning Water and Related Land Resources." Pertinent differences between the Regional Development plans and National Income plans are outlined in the following paragraphs.

Recreation. The recreation plan developed for the Regional Development objective is given in table 127. The initial phase (1970-1980) of the plan provides for the recreation use of 13,000 acres of land and 103,000 acres of water surface area not included in the National Income plan. Between 1980 and 2000, the Regional Development plan provides for recreation use of an additional 343,000 acres of land and 2.1 million acres of water surface area. This compares to additions of 279,000 and 1.7 million acres of land and water, respectively, under the National Income Program.

All of the short-term Regional Development needs could be met within the plan, but there would be long-range deficits in large lakes needed for recreation purposes. These deficits, as in the case of those within the National Income plan, would occur in WRPA's 2, e, and 4, due to the limited potential for developing large lakes (over 500 acres in size) in those areas.

Fish and Wildlife. To meet expressed regional development needs for fish and wildlife would require, among other things, that the region's existing 29.6 million acres of forest remain intact, and that an additional 9.2 million acres of land now used for other purposes be converted to forests by the year 2020. It follows, then, that satisfaction of the fish and wildlife needs for forest land would leave but 23.6 million acres of open land in 2020. This amounts to only a little

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 1				
Open Land				
Transportation				
Urban and Built-up	-	-	-	-
Food and Fiber				
Cropland	188.0	188.0	188.0	188.0
Pastured Cropland	30.0	30.0	30.0	30.0
Permanent Pasture	32.0	32.0	32.0	32.0
Other	62.0	62.0	62.0	62.0
Commercial Fisheries	-	-	-	-
Minerals	-	-	-	-
Recreation				
Class A	-	-	-	-
Class B	-	-	-	-
Fish and Wildlife				
(Cropland)	-	-	-	-
(Pastureland)	-	-	-	-
(Wetlands)	-	-	-	-
Environmental Quality	-	-	-	-
Forest Land				
Food and Fiber				
Forest Products, et al.	879.0	879.0	879.0	879.0
Animal Roughage (Pasture)1/	(135.0)	(135.0)	(368.0)	(368.0)
Recreation				
Class B	-	-	-	-
Class C	-	-	-	-
Fish and Wildlife2/	(131.1)	(131.1)	(131.1)	(131.1)
Environmental Quality				
Botanical Systems				
Bottomland Hardwood Areas1/	(879.0)	(879.0)	(879.0)	(879.0)
Ecological Systems	-	-	-	-
Geological Systems	-	-	-	-
Lake Shores1/	-	(6.0)	(6.0)	(6.0)
Scenic River Banks	-	-	-	-
Wetlands	-	-	-	-
Wilderness Areas	-	-	-	-
Land Covered by Water				
Large Water Areas	368.0	368.0	368.0	368.0
Small Water Areas	-	-	-	-
Total Area, WRPA 1	1,559.0	1,559.0	1,559.0	1,559.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 2				
Open Land				
Transportation, Urban and Built-up	367.0	392.0	448.0	541.0
Food and Fiber				
Cropland	6,192.0	7,201.0	7,849.0	7,757.0
Pastured Cropland	380.0	501.0	534.0	552.0
Permanent Pasture	693.0	314.0	339.0	350.0
Other	247.0	379.0	253.0	174.0
Commercial Fisheries3/	(16.0)	(21.0)	(30.0)	(40.0)
Minerals3/	(26.0)	(40.0)	(71.0)	(118.0)
Recreation				
Class A4/	(6.1)	(7.1)	(9.6)	(14.4)
Class B5/	(7.1)	(7.5)	(8.3)	(12.4)
Fish and Wildlife				
(Cropland)6/	-	(309.0)	(357.0)	(393.0)
(Pastureland)5/	-	(132.0)	(153.0)	(168.0)
(Wetlands)3/	-	(101.0)	(101.0)	(101.0)
Environmental Quality				
Open and Green Space7/	(6.1)	(8.0)	(8.0)	(8.0)
Ecological Systems8/		1.0	1.0	1.0
Geological Systems5/		(157.0)	(157.0)	(157.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,634.0	1,692.0	1,035.0	1,025.0
Animal Roughage (Pasture)1/	(365.0)	(447.0)	(609.0)	(574.0)
Recreation				
Class B1/	(7.0)	(7.6)	(8.3)	(12.4)
Class C1/	(0.6)	(0.6)	(0.8)	(1.1)
Fish and Wildlife2/	(280.5)	(381.0)	(474.6)	(616.1)
Environmental Quality 1/				
Bottomland Hardwood Areas	(1,128.0)	(690.0)	(390.0)	(360.0)
Ecological Systems1/		(120.0)	(90.0)	(80.0)
Geological Systems1/		(350.0)	(250.0)	(230.0)
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(18.0)	(18.0)	(18.0)
Wilderness Areas1/		(44.0)	(30.0)	(30.0)
Land Covered by Water				
Large Water Areas	91.0	124.0	145.0	204.0
Small Water Areas	98.0	98.0	98.0	98.0
Total Area, WRPA 2	10,702.0	10,702.0	10,702.0	10,702.0

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Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 3				
Open Land				
Transportation, Urban and Built-up	355.0	439.0	612.0	843.0
Food and Fiber				
Cropland	2,206.0	2,094.0	2,404.0	2,459.0
Pastured Cropland	746.0	1,117.0	1,323.0	1,411.0
Permanent Pasture	929.0	501.0	639.0	626.0
Other	200.0	392.0	384.0	354.0
Commercial Fisheries3/	(0.6)	(1.0)	(2.0)	(3.0)
Minerals3/	(2.0)	(4.0)	(9.0)	(14.0)
Recreation				
Class A4/	(2.9)	(15.3)	(27.2)	(46.4)
Class B5/	(2.4)	(13.2)	(23.4)	(40.0)
Fish and Wildlife				
(Cropland)6/	-	(715.0)	(1,010.0)	(1,409.0)
(Pastureland)5/	-	(307.0)	(433.0)	(604.0)
(Wetlands)3/	-	(41.0)	(41.0)	(41.0)
Environmental Quality7/	(2.9)	(34.0)	(34.0)	(34.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,301.0	1,991.0	951.0	384.0
Animal Roughage (Pasture)1/	(297.0)	(464.0)	(549.0)	(230.0)
Recreation				
Class B1/	(2.3)	(13.1)	(23.4)	(40.0)
Class C1/	(0.2)	(1.3)	(2.2)	(3.5)
Fish and Wildlife2/	(186.3)	(228.1)	(284.1)	(368.9)
Environmental Quality				
Bottomland Hardwood Areas1/	(796.0)	(700.0)	(320.0)	(200.0)
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(28.0)	(28.0)	(28.0)
Wetlands1/		(64.0)	(64.0)	(64.0)
Land Covered by Water				
Large Water Areas	40.0	252.0	473.0	709.0
Small Water Areas	32.0	32.0	32.0	32.0
Total Area, WRPA 3	6,818.0	6,818.0	6,818.0	6,818.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 4				
Open Land				
Transportation, Urban and Built-up	328.0	357.0	408.0	485.0
Food and Fiber				
Cropland	3,314.0	3,545.0	3,883.0	3,804.0
Pastured Cropland	326.0	578.0	658.0	645.0
Permanent Pasture	943.0	1,819.0	1,843.0	1,870.0
Other	207.0	253.0	199.0	130.0
Commercial Fisheries3/	(11.3)	(20.0)	(37.0)	(54.0)
Minerals3/	(3.0)	(4.0)	(6.0)	(7.0)
Recreation				
Class A4/	(0.8)	(4.2)	(6.3)	(9.3)
Class B5/	(1.0)	(3.4)	(5.1)	(7.6)
Fish and Wildlife				
(Cropland)6/	-	(318.0)	(371.0)	(444.0)
(Pastureland)5/	-	(136.0)	(159.0)	(190.0)
(Wetlands)3/	-	(97.0)	(97.0)	(97.0)
Environmental Quality7/	(0.8)	(8.0)	(8.0)	(8.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	3,222.0	1,739.0	1,247.0	1,246.0
Animal Roughage(Pasture)1/	(587.0)	(1,073.0)	(748.0)	(800.0)
Recreation				
Class B1/	(0.9)	(3.4)	(5.1)	(7.6)
Class C1/	(26.0)	(26.1)	(36.9)	(52.8)
Fish and Wildlife2/	(165.4)	(257.6)	(320.9)	(416.6)
Environmental Quality 1/				
Bottomland Hardwood Areas	(1,148.0)	(947.0)	(947.0)	(947.0)
Ecological Systems1/		(10.0)	(10.0)	(10.0)
Geological Systems1/		(1.0)	(1.0)	(1.0)
Lake Shores1/		(2.0)	(2.0)	(2.0)
Wilderness Areas1/		(5.0)	(5.0)	(5.0)
Land Covered by Water				
Large Water Areas	74.0	123.0	176.0	234.0
Small Water Areas	133.0	133.0	133.0	133.0
Total Area, WRPA 4	8,547.0	8,547.0	8,547.0	8,547.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 5				
Open Land				
Transportation				
Urban and Built-up	440.0	487.0	605.0	736.0
Food and Fiber				
Cropland	732.0	797.0	1,460.0	2,387.0
Pastured Cropland	239.0	567.0	668.0	836.0
Permanent Pasture	982.0	887.0	1,071.0	1,356.0
Other	192.0	215.0	205.0	267.0
Commercial Fisheries3/	(3.6)	(6.0)	(12.0)	(18.0)
Minerals3/	(8.0)	(10.0)	(12.0)	(15.0)
Recreation				
Class A4/	(2.6)	(6.6)	(10.4)	(15.8)
Class B5/	(2.3)	(5.6)	(8.9)	(13.5)
Fish and Wildlife				
(Cropland)6/	-	(419.0)	(528.0)	(650.0)
(Pastureland)5/	-	(180.0)	(226.0)	(279.0)
Environmental Quality7/	(2.6)	(13.0)	(13.0)	(13.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	10,228.0	9,802.0	8,720.0	6,951.0
Animal Roughage(Pasture)1/	(947.0)	(1,048.0)	(1,880.0)	(2,907.0)
Recreation				
Class B 1/	(2.2)	(5.6)	(8.9)	(13.4)
Class C 1/	(23.8)	(23.8)	(36.3)	(54.7)
Fish and Wildlife				
Management Areas, etc.2/	(258.4)	(361.9)	(450.8)	(585.2)
Wetlands1/	-	(605.0)	(791.0)	(791.0)
Environmental Quality 1/				
Bottomland Hardwood Areas	(2,362.0)	(2,284.0)	(2,180.0)	(1,931.0)
Ecological Systems1/		(20.0)	(20.0)	(20.0)
Geological Systems1/		(22.0)	(22.0)	(22.0)
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(28.0)	(28.0)	(28.0)
Wilderness Areas 1/		(25.0)	(25.0)	(25.0)
Land Covered by Water				
Large Water Areas	175.0	233.0	259.0	455.0
Small Water Areas	76.0	76.0	76.0	76.0
Total Area, WRPA 5	13,064.0	13,064.0	13,064.0	13,064.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 6				
Open Land				
Transportation, Urban and Built-up	78.0	79.0	82.0	88.0
Food and Fiber				
Cropland	1,908.0	2,020.0	2,044.0	2,039.0
Pastured Cropland	118.0	191.0	191.0	190.0
Permanent Pasture	494.0	437.0	409.0	408.0
Other	32.0	82.0	82.0	82.0
Commercial Fisheries3/	(1.4)	(4.0)	(9.0)	(14.0)
Minerals3/	(2.0)	(2.0)	(3.0)	(5.0)
Recreation				
Class A4/	(0.5)	(1.9)	(2.4)	(3.3)
Class B5/	(0.4)	(1.6)	(2.1)	(2.9)
Fish and Wildlife				
(Cropland)6/	-	(88.0)	(88.0)	(100.0)
(Pastureland)5/	-	(38.0)	(38.0)	(43.0)
Environmental Quality				
Open and Green Space7/	(0.5)	(2.0)	(2.0)	(2.0)
Botanical Systems		1.0	1.0	1.0
Forest Land				
Food and Fiber				
Forest Products, et al.	831.0	651.0	649.0	638.0
Animal Roughage(Pasture)1/	(117.0)	(224.0)	(390.0)	(415.0)
Recreation				
Class B1/	(0.3)	(1.6)	(2.0)	(2.8)
Class C1/	(0.0)	(0.2)	(0.2)	(0.3)
Fish and Wildlife				
Management Areas, etc.2/	(45.2)	(70.2)	(87.4)	(113.5)
Wetlands1/	-	(85.0)	(85.0)	(85.0)
Environmental Quality				
Bottomland Hardwood Areas1/	(756.0)	(609.0)	(609.0)	(609.0)
Land Covered by Water				
Large Water Areas	32.0	32.0	35.0	47.0
Small Water Areas	40.0	40.0	40.0	40.0
Total Area, WRPA 6	3,533.0	3,533.0	3,533.0	3,533.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 7				
Open Land				
Transportation, Urban and Built-up	116.0	133.0	158.0	188.0
Food and Fiber				
Cropland	337.0	197.0	711.0	618.0
Pastured Cropland	180.0	315.0	440.0	495.0
Permanent Pasture	941.0	1,018.0	1,512.0	1,629.0
Other	30.0	68.0	70.0	27.0
Commercial Fisheries3/	(0.9)	(1.0)	(3.0)	(4.0)
Minerals3/	(1.0)	(1.0)	(1.0)	(2.0)
Recreation				
Class A4/	(0.4)	(1.8)	(2.7)	(3.9)
Class B5/	(0.4)	(1.5)	(2.3)	(3.4)
Fish and Wildlife				
(Cropland)6/	-	(83.0)	(99.0)	(120.0)
(Pastureland)5/	-	(35.0)	(43.0)	(51.0)
Environmental Quality7/	(0.4)	(1.0)	(1.0)	(1.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,509.0	2,327.0	1,064.0	998.0
Animal Roughage(Pasture)1/	(694.0)	(1,251.0)	(638.0)	(580.0)
Recreation				
Class B	(0.3)	(1.5)	(2.3)	(3.4)
Class C	(0.1)	(0.1)	(0.2)	(0.3)
Fish and Wildlife				
Management Areas, etc.2/	(74.0)	(104.0)	(129.6)	(168.2)
Wetlands1/	-	(49.0)	(49.0)	(49.0)
Environmental Quality				
Bottomalnd Hardwood Areas1/	(500.0)	(463.0)	(407.0)	(407.0)
Ecological Systems1/		(3.0)	(3.0)	(3.0)
Geological Systems1/		(1.0)	(1.0)	(1.0)
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(13.0)	(13.0)	(13.0)
Wilderness Areas1/		(30.0)	(30.0)	(30.0)
Land Covered by Water				
Large Water Areas	38.0	93.0	196.0	196.0
Small Water Areas	56.0	56.0	56.0	56.0
Total Area, WPPA 7	4,207.0	4,207.0	4,207.0	4,207.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 8				
Open Land				
Transportation, Urban and Built-up	182.0	222.0	292.0	380.0
Food and Fiber				
Cropland	329.0	217.0	323.0	405.0
Pastured Cropland	54.0	349.0	408.0	449.0
Permanent Pasture	655.0	587.0	719.0	797.0
Other	48.0	59.0	52.0	27.0
Commercial Fisheries3/	(0.3)	(1.0)	(1.0)	(2.0)
Minerals3/	(4.0)	(5.0)	(7.0)	(9.0)
Recreation				
Class A4/	(0.5)	(6.5)	(11.0)	(17.7)
Class B5/	(0.9)	(5.7)	(9.5)	(15.3)
Fish and Wildlife				
(Cropland)6/	-	(217.0)	(323.0)	(405.0)
(Pastureland)5/	-	(132.0)	(175.0)	(230.0)
Environmental Quality				
Open and Green Space7/	(0.5)	(12.0)	(12.0)	(12.0)
Botanical Systems8/	-	1.0	1.0	1.0
Geological Systems5/	-	(1.0)	(1.0)	(1.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,265.0	2,083.0	1,701.0	1,319.0
Animal Roughage(Pasture)1/	(650.0)	(615.0)	(1,018.0)	(792.0)
Recreation				
Class B1/	(0.8)	(5.6)	(9.4)	(15.2)
Class C1/	(0.0)	(0.6)	(0.9)	(1.3)
Fish and Wildlife				
Management Areas, etc.2/	(5.0)	(19.0)	(23.7)	(30.7)
Wetlands1/	-	(155.0)	(207.0)	(395.0)
Environmental Quality				
Botanical Systems1/	-	(2.0)	(2.0)	(2.0)
Bottomland Hardwood Areas1/	(988.0)	(916.0)	(800.0)	(800.0)
Geological Systems1/	-	(202.0)	(202.0)	(202.0)
Lake Shores1/	-	(1.0)	(1.0)	(1.0)
Scenic River Banks1/	-	(17.0)	(17.0)	(17.0)
Land Covered by Water				
Large Water Areas	73.0	88.0	110.0	228.0
Small Water Areas	45.0	45.0	45.0	45.0
Total Area, WRPA 8	3,651.0	3,651.0	3,651.0	3,651.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 9				
Open Land				
Transportation,				
Urban and Built-up	236.0	245.0	262.0	352.0
Food and Fiber				
Cropland	1,827.0	2,673.0	2,752.0	2,674.0
Pastured Cropland	749.0	1,316.0	1,476.0	1,485.0
Permanent Pasture	911.0	1,072.0	1,202.0	1,265.0
Other	807.0	654.0	747.0	702.0
Commercial Fisheries3/	(10.7)	(14.0)	(20.0)	(26.0)
Minerals3/	(7.0)	(11.0)	(18.0)	(26.0)
Recreation				
Class A4/	(1.3)	(8.1)	(12.2)	(17.4)
Class B5/	(1.0)	(7.0)	(10.5)	(15.0)
Fish and Wildlife				
(Cropland)6/	-	(932.0)	(1,206.0)	(1,675.0)
(Pastureland)5/	-	(162.0)	(195.0)	(318.0)
(Wetlands)3/	-	(154.0)	(260.0)	(533.0)
Environmental Quality				
Open and Green Space7/	(1.3)	(12.0)	(12.0)	(12.0)
Beaches and Shores3/	-	(16.0)	(16.0)	(16.0)
Botanical Systems3/	-	(500.0)	(500.0)	(500.0)
Geological Systems3/	-	(3.0)	(3.0)	(3.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	3,442.0	1,910.0	1,408.0	1,354.0
Animal Roughage(Pasture)1/	(383.0)	(677.0)	(764.0)	(806.0)
Recreation				
Class B 1/	(0.9)	(6.9)	(10.5)	(14.9)
Class C 1/	(0.2)	(0.7)	(1.0)	(1.3)
Fish and Wildlife2/	(690.2)	(717.2)	(893.4)	(1,159.8)
Environmental Quality				
Botanical Systems1/	-	(290.0)	(290.0)	(290.0)
Bottomland Hardwood Areas 1/	(1,324.0)	(1,080.0)	(1,080.0)	(1,080.0)
Geological Systems1/	-	(3.0)	(3.0)	(3.0)
Lake Shores1/	-	(3.0)	(3.0)	(3.0)
Scenic River Banks1/	-	(9.0)	(9.0)	(9.0)
Wetlands1/	-	(121.0)	(121.0)	(121.0)
Wilderness Areas1/	-	(555.0)	(555.0)	(555.0)
Land Covered by Water				
Large Water Areas	400.0	407.0	480.0	540.0
Small Water Areas	138.0	138.0	138.0	138.0
Total Area, WRPA 9	8,510.0	8,510.0	8,510.0	8,510.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 10				
Open Land				
Transportation, Urban and Built-up	230.0	280.0	365.0	476.0
Food and Fiber				
Cropland	310.0	271.0	276.0	265.0
Pastured Cropland	49.0	90.0	102.0	107.0
Permanent Pasture	202.0	295.0	331.0	349.0
Other	1,681.0	1,671.0	1,664.0	1,653.0
Commercial Fisheries3/	(1.2)	(2.0)	(3.0)	(3.0)
Minerals3/	(14.0)	(24.0)	(40.0)	(57.0)
Recreation				
Class A4/	(1.3)	(15.6)	(26.1)	(42.1)
Class B5/	(0.9)	(13.5)	(22.5)	(36.3)
Fish and Wildlife				
(Cropland)6/	-	(271.0)	(276.0)	(265.0)
(Pastureland)5/	-	(314.0)	(415.0)	(456.0)
(Wetlands)3/	-	(297.0)	(392.0)	(518.0)
Environmental Quality				
Open and Green Space7/	(1.3)	(31.0)	(31.0)	(31.0)
Beaches and Shores3/	-	(160.0)	(160.0)	(160.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	1,317.0	1,180.0	1,035.0	923.0
Animal Roughage(Pasture)1/	(32.0)	(59.0)	(66.0)	(70.0)
Recreation				
Class B1/	(0.8)	(13.5)	(22.5)	(36.3)
Class C1/	(0.0)	(1.3)	(2.1)	(3.2)
Fish and Wildlife2/	(185.3)	(196.3)	(244.6)	(317.3)
Environmental Quality				
Botanical Systems1/	-	(1.0)	(1.0)	(1.0)
Bottomland Hardwood Areas1/	(970.0)	(885.0)	(780.0)	(780.0)
Lake Shores1/	-	(4.0)	(4.0)	(4.0)
Scenic River Banks1/	-	(4.0)	(4.0)	(4.0)
Land Covered by Water				
Large Water Areas	939.0	941.0	955.0	955.0
Small Water Areas	219.0	219.0	219.0	219.0
Total Area, WRPA 10	4,947.0	4,947.0	4,947.0	4,947.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA's 1 through 10				
Open Land				
Transportation, Urban and Built-up	2,332.0	2,649.0	3,277.0	4,089.0
Food and Fiber				
Cropland	17,343.0	19,203.0	21,890.0	22,596.0
Pastured Cropland	2,871.0	5,054.0	5,830.0	6,200.0
Permanent Pasture	6,782.0	6,962.0	8,097.0	8,682.0
Other	3,506.0	3,915.0	3,718.0	3,478.0
Commercial Fisheries3/	(46.0)	(70.0)	(117.0)	(164.0)
Minerals3/	(67.0)	(101.0)	(167.0)	(253.0)
Recreation				
Class A4/	(16.4)	(67.6)	(107.9)	(170.3)
Class B5/	(16.0)	(58.9)	(92.5)	(146.2)
Fish and Wildlife				
(Cropland)6/		(3,352.0)	(4,259.0)	(5,461.0)
(Pastureland)5/		(1,436.0)	(1,837.0)	(2,339.0)
(Wetlands)3/		(690.0)	(891.0)	(1,290.0)
Environmental Quality				
Open and Green Space7/	(16.4)	(122.0)	(122.0)	(122.0)
Beaches and Shores3/	-	(176.0)	(176.0)	(176.0)
Botanical Systems	-	(501.0)9/	(501.0)9/	(501.0)9/
Ecological Systems8/	-	1.0	1.0	1.0
Geological Systems		(161.0)	(161.0)	(161.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	29,637.0	24,254.0	18,689.0	15,717.0
Animal Roughage(Pasture)1/	(4,207.0)	(5,993.0)	(7,030.0)	(7,542.0)
Recreation				
Class B	(15.9)	(58.9)	(92.5)	(146.2)
Class C	(50.9)	(54.7)	(80.6)	(118.5)
Fish and Wildlife				
Management Areas,etc.1/	(2,021.4)	(2,466.4)	(3,040.2)	(3,907.4)
Wetlands1/	-	(894.0)	(1,132.0)	(1,320.0)
Environmental Quality				
Botanical Systems1/ 1/		(293.0)	(293.0)	(293.0)
Bottomland Hardwood Areas	(10,852.0)	(9,453.0)	(8,392.0)	(7,820.0)
Ecological Systems1/		(153.0)	(123.0)	(113.0)
Geological Systems1/		(579.0)	(479.0)	(459.0)
Lake Shores1/		(20.0)	(20.0)	(20.0)
Scenic River Banks1/		(117.0)	(117.0)	(117.0)
Wetlands1/		(185.0)	(185.0)	(185.0)
Wilderness Areas1/		(659.0)	(645.0)	(645.0)
Land Covered by Water				
Large Water Areas	2,230.0	2,661.0	3,197.0	3,936.0
Small Water Areas	837.0	837.0	837.0	837.0
Total Area, LMR	65,538.0	65,538.0	65,538.0	65,538.0

Table 126 - Land Use Allocation for Regional Development, Lower Mississippi Region (Cont'd)

1/ Multiple-use land. Counted in forest products acreage.
2/ Primary use for fish and wildlife. Counted in forest products acreage.
3/ Multiple-use land. Counted in other open land acreage.
4/ Primary use for recreation. Counted in transportation, urban and built-up acreage.
5/ Multiple-use land counted in permanent pasture acreage.
6/ Multiple-use land. Counted in cropland acreage.
7/ Multiple-use with Class A recreation land. Counted in transportation, urban and built-up acreage.
8/ Exclusive use for environmental quality purposes. Not counted elsewhere.
9/ Exclusive use on 2,000 acres for environmental quality purposes. Remaining 500,000 acres are multiple-use and counted in other open land acreage.

Table 127 - Recreation Plan, Regional Development Objective, Lower Mississippi Region (cont'd)

		WATER AREAS									LAND AREAS			
		Total Recreation Lakes (1,000 Acres)									Class A Land (1,000 Acres)			
				Needs Satisfaction[3]								Proposed Development		
						New Reservoir Construction								
WRPA	Time Frame	Available Resource	Resource Needed	Intra-WRPA Use[2]	Inter-WRPA Commuting	Single Purpose	Multi-Purpose	Sub-total	Total	Existing Development[1]	Access & Facilities[2]	Acquisition & Facilities[2]	Subtotal[4]
2	1980	91	117	91	26	0	0	0	117	6.1	0.0	1.0	7.1
	2000		185	91	18	17	37	54	163		0.0	2.5	9.6
	2020		292	145	19	58	1	59	223		0.0	4.8	14.4
3	1980	40	271	40	19	166	46	212	271	2.9	8.7	3.7	15.3
	2000		523	252	19	200	21	221	492		8.3	3.6	27.2
	2020		943	473	19	219	17	236	728		13.5	5.7	46.4
4.	1980	74	121	74	12	29	6	35	121	0.8	2.7	0.7	4.2
	2000		192	109	12	52	16	68	189		1.5	0.6	6.3
	2020		297	177	13	55	2	51	247		0.0	3.0	9.3
5	1980	175	159	159	0	0	0	0	159	2.6	4.0	0.0	6.6
	2000		273	175	98	0	0	0	273		3.8	0.0	10.4
	2020		435	175	30	184	46	230	435		5.4	0.0	15.8
6	1980	32	34	31	3	0	0	0	34	0.5	1.4	0.0	1.9
	2000		45	32	9	4	0	4	45		0.5	0.0	2.4
	2020		67	36	20	11	0	11	67		0.9	0.0	3.3
7	1980	38	31	31	0	0	0	0	31	0.4	1.3	0.1	1.7
	2000		51	38	1	0	12	12	51		0.9	0.0	2.6
	2020		82	50	12	0	20	20	82		0.8	0.4	3.8
8	1980	73	116	73	43	0	0	0	116	0.5	2.4[5]	3.6	6.5
	2000		211	73	138	0	0	0	211		0.0	4.5	11.0
	2020		360	73	132	36	42	155	360		0.0	6.7	17.7
9	1980	400	143	143	0	0	0	0	143	1.3	1.3[6]	5.5	8.1
	2000		235	235	0	0	0	0	235		0.0	5.4	13.5
	2020		353	353	0	0	0	0	353		0.0	5.2	18.7
10	1980	939	277	277	0	0	0	0	277	1.3	2.0[7]	12.3	15.6
	2000		503	503	0	0	0	0	503		0.0	10.5	26.1
	2020		856	856	0	0	0	0	856		0.0	16.0	42.1
LMR	1980	1,862	1,269	919	103	195	52	247	1,269	16.4	23.8	26.9	67.1
	2000		2,218	1,508	295	273	86	359	2,162		15.0	27.1	109.2
	2020		3,685	2,338	245	563	128	768	3,351		20.6	41.8	171.6

Table 127 - Recreation Plan, Regional Development Objective, Lower Mississippi Region

WATER AREAS

Large Recreation Lakes (1,000 Acres)[1]

WRPA/Time Frame		Available Resource	Resource Needed	Needs Satisfaction[3]: Intra-WRPA Use[5]	Inter-WRPA Commuting[6]	New Reservoir Construction[4]: Single Purpose	Multi-Purpose	Sub-total	Total
2	1980	22	44	22	22	0	0	0	44
	2000		74	22	16	0	14	14	52
	2020		122	36	17	0	0	0	53
3	1980	4	102	4	17	79	2	81	102
	2000		210	85	17	77	0	77	179
	2020		394	162	17	0	0	0	179
4	1980	49	45	45	0	0	0	0	45
	2000		77	49	11	0	14	14	74
	2020		124	63	11	0	0	0	74
5	1980	175	60	60	0	0	0	0	60
	2000		110	110	0	0	0	0	110
	2020		182	175	7	0	0	0	182
6	1980	10	13	10	3	0	0	0	13
	2000		18	10	8	0	0	0	18
	2020		28	10	18	0	0	0	28
7	1980	23	12	12	0	0	0	0	12
	2000		21	21	0	0	0	0	21
	2020		34	23	11	0	0	0	34
8	1980	51	44	44	0	0	0	0	44
	2000		85	51	34	0	0	0	85
	2020		150	51	99	0	0	0	150
9	1980	316	54	54	0	0	0	0	54
	2000		94	94	0	0	0	0	94
	2020		147	147	0	0	0	0	147
10	1980	432	104	104	0	0	0	0	104
	2000		202	202	0	0	0	0	202
	2020		357	357	0	0	0	0	357
LMR	1980	1,082	478	355	42	79	2	81	478
	2000		891	644	86	77	28	105	835
	2020		1,538	1,024	180	0	0	0	1,204

Small Recreation Lakes (1,000 Acres)[2]

WRPA/Time Frame		Available Resource	Resource Needed	Needs Satisfaction[3]: Intra-WRPA Use[5]	Inter-WRPA Commuting	New Reservoir Construction: Single Purpose	Multi-Purpose	Sub-total	Total
2	1980	69	73	69	4	0	0	0	73
	2000		111	69	2	17	23	40	111
	2020		170	109	2	58	1	59	170
3	1980	36	169	36	2	87	44	131	169
	2000		313	167	2	123	21	144	313
	2020		549	311	2	219	17	236	549
4	1980	25	76	29[7]	12	29	6	35	76
	2000		115	60	1	52	2	54	115
	2020		173	114	2	55	2	57	173
5	1980	0	99	99[7]	0	0	0	0	99
	2000		163	65[7]	98	0	0	0	163
	2020		253	0	23	184	46	230	253
6	1980	22	21	21	0	0	0	0	21
	2000		27	22	1	4	0	4	27
	2020		39	26	2	11	0	11	39
7	1980	15	19	19[7]	0	0	0	0	19
	2000		30	17[7]	1	0	12	12	30
	2020		48	27	1	0	20	20	48
8	1980	22	72	29[7]	43	0	0	0	72
	2000		126	22	104	0	0	0	126
	2020		210	22	33	36	42	155	210
9	1980	84	89	89[7]	0	0	0	0	89
	2000		141	141[7]	0	0	0	0	141
	2020		206	206[7]	0	0	0	0	206
10	1980	507	173	173	0	0	0	0	173
	2000		301	301	0	0	0	0	301
	2020		499	499	0	0	0	0	499
LMR	1980	780	791	564	61	116	50	166	791
	2000		1,327	864	209	196	58	254	1,327
	2020		2,147	1,314	65	563	128	768	2,147

1/ Water bodies larger than 500 acres.
2/ Water bodies between 40 and 500 acres.
3/ Program A measures for needs satisfaction consist of new construction. Associated public investments include costs of single-purpose recreation reservoirs and appropriate portion of costs of multi-purpose reservoirs.
4/ Limited by development potential of region (See table 92).
5/ Includes use of reservoirs constructed in previous time periods.
6/ Commuting to lakes in other WRPA's having surpluses of large water. Includes commuting to WRPA 1, which contains 368,000 acres of large water.
7/ Includes use of available large lakes.

Table 127 - Recreation Plan, Regional Development Objective, Lower Mississippi Region (cont'd)

		LAND AREAS											
		Class B Land (1,000 Acres)				Class C Land (1,000 Acres)				Total Recreation Land (1,000 Acres)			
			Proposed Development				Proposed Development				Proposed Development		
WRPA	Time Frame	Existing Development1/	Access & Facilities2/	Acquisition & Facilities3/	Subtotal4/	Existing Development1/	Access Only2/	Acquisition & Access3/	Subtotal4/	Existing Development1/	Access & Facilities2/	Acquisition, Access & Facilities3/	WRPA Total4/
2	1980	14.1	0.0	1.0	15.1	0.6	0.0	0.0	0.6	20.8	0.0	2.0	22.8
	2000		0.0	1.5	16.6		0.0	0.2	0.8		0.0	4.2	27.0
	2020		0.0	8.2	24.8		0.0	0.3	1.1		0.0	13.3	40.3
3	1980	4.7	19.4	2.2	26.3	0.2	1.1	0.0	1.3	7.8	29.2	5.9	42.9
	2000		18.5	2.0	46.8		0.9	0.0	2.2		27.7	5.6	76.2
	2020		29.9	3.3	80.0		1.3	0.0	3.5		44.7	9.0	129.9
4	1980	1.9	3.9	1.0	6.8	26.5	0.0	0.0	26.5	29.2	6.6	1.7	37.5
	2000		2.7	0.7	10.2		10.4	0.0	36.9		14.6	1.3	53.4
	2020		4.0	1.0	15.2		15.9	0.0	52.8		19.9	4.0	77.3
5	1980	4.5	6.7	0.0	11.2	23.8	0.0	0.0	23.8	30.9	10.7	0.0	41.6
	2000		6.6	0.0	17.8		12.5	0.0	36.3		22.9	0.0	64.5
	2020		9.1	0.0	26.9		18.4	0.0	54.7		32.9	0.0	97.4
6	1980	0.7	2.5	0.0	3.2	0.0	0.0	0.2	0.2	1.2	3.9	0.2	5.3
	2000		0.9	0.0	4.1		0.0	0.0	0.2		1.4	0.0	6.7
	2020		1.6	0.0	5.7		0.0	0.1	0.3		2.5	0.1	9.3
7	1980	0.7	2.1	0.2	3.0	0.1	0.0	0.0	0.1	1.2	3.4	0.3	4.9
	2000		1.4	0.2	4.6		0.1	0.0	0.2		2.4	0.2	7.5
	2020		2.0	0.2	6.8		0.1	0.0	0.3		2.9	0.6	11.0
8	1980	1.7	5.7	3.9	11.3	0.0	0.0	0.6	0.6	2.2	8.1	8.1	18.4
	2000		0.0	7.6	18.9		0.0	0.3	0.9		0.0	12.4	30.8
	2020		0.0	11.6	30.5		0.0	0.4	1.3		0.0	18.7	49.5
9	1980	1.9	10.8	1.2	13.9	0.2	0.5	0.0	0.7	3.4	12.6	6.7	22.7
	2000		0.0	7.1	21.0		0.3	0.0	1.0		0.3	12.5	35.5
	2020		0.0	8.9	29.9		0.3	0.0	1.3		0.3	14.1	49.9
10	1980	1.7	6.3	19.0	27.0	0.0	0.1	1.2	1.3	3.0	8.4	32.5	43.9
	2000		0.0	18.0	45.0		0.0	0.8	2.1		0.0	29.3	73.2
	2020		0.0	27.6	72.6		0.0	1.1	3.2		0.0	44.7	117.9
LMR	1980	31.9	57.4	28.3	117.6	51.4	1.6	2.0	55.0	99.7	82.8	57.2	239.7
	2000		30.1	37.1	184.8		24.2	1.3	80.5		69.3	65.5	374.5
	2020		46.6	60.8	292.2		36.0	1.9	118.4		103.2	104.5	582.2

over half the 45 million acres of open land needed for transportation, urban and built-up purposes, and for food and fiber production. But long-range conflicts between open land-forest land needs will arise regardless of program objectives, and land-use priorities must be considered here and elsewhere in formulating future resource development plans and programs for the region.

In following the land-use priorities adopted for this study, the open land requirements for food and fiber production, and the like, would be met despite undesirable losses in forest land. This means that 14 million acres of forest land would be converted to open land to meet the high priority Regional Development needs. Hence, only 40 percent of the total forest land needs for fish and wildlife habitat could be satisfied in the year 2020. On the other hand, all fish and wildlife needs for cropland, pastureland, and wetland habitat and all needs for water surface areas and water withdrawals could be met throughout the study period.

The fish and wildlife plan adopted for the Regional Development objective is summarized in table 128. The plan provides for the acquisition of 1.9 million acres of forest land to be used primarily for fish and wildlife purposes. It also provides for access to 7,700 miles of fishing streams and for water withdrawals necessary to maintain water levels in wildlife management areas for mast-producing green tree reservoirs and duck resting areas.

Environmental Quality. The environmental quality plan for the Regional Development Program is identical to the plan developed for the National Income Program (see table 104). It provides for the creation of open and green space in urban areas, the protection of scenic rivers and streams, and the preservation of certain areas with unusual ecological attributes or wilderness characteristics.

Flood Control. The flood control plan for the regional development objective (table 129) consists of the three basic components described in the National Income Program:

1. Expeditious completion of the backlog of ongoing projects which (though considered as complete) lack a great deal of work;

2. Construction of authorized and proposed improvements as shown in table 129; and

3. Expansion of flood plain information activities, and development and implementation of appropriate local controls to govern the growth of damageable development in flood plains.

Program B differs from Program A to the extent that construction of authorized flood control works would be accelerated. Many proposed

Table 128 - Fish and Wildlife Plan, Regional Development Objective, Lower Mississippi Region

		Water Surface Areas															
		Lakes (1,000 Acres) 1/				Ponds (1,000 Acres) 1/			Estuaries (1,000 Acres) 1/				Total Water Surface Area (1,000 Acres)			
			Incremental Use							Incremental Use				Incremental Use		
WRPA	Time Frame	Available Resource 2/	Intra-WRPA	Inter-WRPA Commuting	Cumulative Use	Available Resource 2/	Incremental Use	Cumulative Use	Available Resource 2/	Intra-WRPA	Inter-WRPA Commuting	Cumulative Use	Available Resource	Intra-WRPA	Inter-WRPA Commuting	Total Use
2	1980	189	39	0	39	52	28	28	0	0	25	25	241	67	25	92
	2000		6	0	45		5	33		0	2	27		11	2	105
	2020		10	0	55		7	40		0	5	32		17	5	127
3	1980	74	72	19	91	104	66	66	0	0	56	56	176	138	75	213
	2000		0	37	128		26	92		0	20	76		26	57	296
	2020		0	51	179		37	129 3/		0	28	104		37	79	412
4	1980	207	40	0	40	54	29	29	0	0	25	25	361	69	25	94
	2000		7	0	47		5	34		0	3	28		12	3	109
	2020		9	0	56		7	41		0	5	33		16	5	130
5	1980	251	53	0	53	68	38	38	0	0	41	41	319	91	41	132
	2000		14	0	67		10	48		0	3	44		24	3	159
	2020		16	0	83		12	60		0	10	54		28	10	197
6	1980	72	11	0	11	16	8	8	0	0	9	9	88	19	9	28
	2000		0	0	11		0	8		0	0	9		0	0	28
	2020		2	0	13		1	9		0	0	9		3	0	31
7	1980	94	10	0	10	14	8	8	0	0	8	8	108	18	8	26
	2000		3	0	13		1	9		0	1	9		4	1	31
	2020		2	0	15		2	11		0	2	111		4	2	37
8	1980	118	39	0	39	46	28	28	0	0	158	158	164	67	158	225
	2000		13	0	52		9	37		0	44	202		22	44	291
	2020		16	0	68		12	49 3/		0	61	263		28	61	380
9	1980	538	48	0	48	62	35	35	545	114	0	114	1,145	197	0	197
	2000		9	0	57		7	42		15	0	129		31	0	228
	2020		10	0	67		6	48		22	0	151		38	0	266
10	1980	1,158	93	0	93	108	67	67	2,736	503	0	503	4,002	663	0	663
	2000		30	0	123		22	89		140	0	643		192	0	855
	2020		39	0	162		28	117 3/		191	0	834		258	0	1,113
LMR	1980	3,067	405	19	424	524	307	307	3,281	617	322	939	6,872	1,329	341	1,670
	2000		82	37	543		85	392		155	73	1,167		322	110	2,102
	2020		104	51	698		112	504		213	111	1,491		429	162	2,693

1/ No public investment involved.
2/ Based on 1970 conditions.
3/ Includes use of ponds expected to be constructed by private interests between 1970 and 2020.

Table 128 - Fish and Wildlife Plan, Regional Development Objective, Lower Mississippi Region (cont'd)

WRPA	Time Frame	Water Surface Areas: Cumulative Stream Access & Protection 6/ (miles)	Water Surface Areas: Cumulative Water Withdrawals 7/ (mgd)	Land Areas: Primary Use Wildlife Lands (1,000 Acres) 4/: Existing	Primary Use: Incremental Additions 5/: Open Land	Primary Use: Incremental Additions 5/: Forest	Primary Use: Cumulative Subtotal	Secondary Use Wildlife Lands (1,000 Acres) 1/: Open Land: Cropland	Secondary Use: Open Land: Pasture	Secondary Use: Wetlands	Secondary Use: Forests	Secondary Use: Subtotal	Total Wildlife Lands (1,000 Acres): Open Land	Total: Wetlands	Total: Forests	Total
2	1980	1,203	630	280.5	3.5	100.5	384.5	309.0	128.5	101.0 7/	1312.0	1850.5	441.0	101.0	1693.0	2235.0
	2000	1,203	740		0	93.7	478.2	357.0	149.5	101.0 7/	540.3	1147.8	510.0	101.0	1015.0	1626.0
	2020	1,203	850		0	141.4	619.6	393.0	164.5	101.0 7/	340.9	999.4	561.0	101.0	957.0	1619.0
3	1980	822	76	186.3	15.4	41.8	243.5	715.0	291.6	64.0 7/	1762.9	2833.5	1022.0	64.0	1991.0	3077.0
	2000	822	122		0	56.0	299.5	1010.0	417.6	64.0 7/	666.9	2158.5	1443.0	64.0	951.0	2458.0
	2020	822	248		0	84.8	384.3	1409.0	588.6	64.0 7/	15.1	2076.7	2013.0	64.0	384.0	2461.0
4	1980	1,100	53	165.4	0	92.2	257.6	318.0	136.0	97.0 7/	1481.4	2032.4	454.0	97.0	1739.0	2290.0
	2000	1,100	83		0	63.3	320.9	371.0	159.0	97.0 7/	925.1	1552.1	530.0	97.0	1246.0	1873.0
	2020	1,100	117		0	95.7	416.6	444.0	190.0	97.0 7/	829.4	1560.4	634.0	97.0	1246.0	1977.0
5	1980	1,931	285	258.4	0	103.5	361.9	419.0	180.0	605.0	8851.2	10,055.1	599.0	605.0	9213.0	10,417.0
	2000	1,931	345		0	88.9	450.8	528.0	226.0	791.0	8273.2	9818.2	754.0	791.0	8724.0	10,269.0
	2020	1,931	407		0	134.4	585.2	650.0	279.0	791.0 7/	6369.8	8089.8	929.0	791.0	6955.0	8675.0
6	1980	536	75	45.2	0	25.0	70.2	88.0	38.0	85.0	581.8	792.8	126.0	85.0	652.0	863.0
	2000	536	91		0	17.2	87.4	88.0	38.0	85.0	562.6	773.6	126.0	85.0	650.0	861.0
	2020	536	108		0	26.1	113.5	100.0	43.0	85.0	525.5	753.5	143.0	85.0	639.0	867.0
7	1980	450	7	74.0	0	30.0	104.0	83.0	35.0	49.0	2223.0	2390.0	118.0	49.0	2327.0	2494.0
	2000	450	13		0	25.6	129.6	99.0	43.0	49.0	934.4	1125.4	142.0	49.0	1064.0	1255.0
	2020	450	18		0	38.6	168.2	120.0	51.0	49.0 7/	779.8	999.8	171.0	49.0	948.0	1168.0
8	1980	400	5	5.0	0	14.0	19.0	217.0 8/	132.0	155.0	2065.0	2569.0	349.0	155.0	2084.0	2588.0
	2000	400	8		0	4.7	23.7	323.0 8/	175.0	207.0	1673.3	2378.3	498.0	207.0	1697.0	2402.0
	2020	400	12		0	7.0	30.7	405.0 8/	230.0	395.0 7/	1289.3	2319.3	635.0	395.0	1320.0	2350.0
9	1980	928	557	690.2	00	27.0	717.2	932.0	162.0	154.0	1192.8	2440.8	1094.0	154.0	1910.0	3158.0
	2000	928	745		0	176.2	893.4	1206.0	195.0	260.0	514.6	2175.6	1401.0	260.0	1408.0	3069.0
	2020	928	865		0	266.4	1159.8	1675.0	318.0	533.0	109.2	2635.2	1993.0	533.0	1269.0	3795.0
10	1980	329	1,845	185.3	0	11.0	196.3	271.0 8/	314.0	297.0	983.7	1865.7	585.0	297.0	1180.0	2062.0
	2000	329	1,847		0	48.3	244.6	276.0 8/	415.0	392.0	790.4	1873.4	691.0	392.0	1035.0	2118.0
	2020	329	1,848		0	72.7	317.3	265.0 8/	456.0 7/	518.0	598.7	1837.7	721.0	518.0	916.0	2155.0
LMR	1980	7,699	3,533	2021.4 9/	18.9	445.0	2485.3	3352.0	1417.1	1584.0	21,201.7 2/	27,573.6	4788.0	1584.0	23,668.0	30.059.0
	2000	7,699	4,034		0	573.8	3059.1	4259.0	1818.1	2023.0	15,628.7 2/	23,747.7	6096.0	2023.0	18,669.0	25,931.0
	2020	7,699	4,473		0	867.2	3926.3	5461.0	2320.1	2610.0	11,605.6 2/	21,271.8	7800.0	2610.0	15,513.0	25,067.0

4/ Composed primarily of wildlife management areas. Existing areas are heavily wooded and counted entirely as forest land.
5/ Public acquisition through easement or fee title.
6/ Public investment based on provision of one access point for every 10 miles of stream.
7/ Withdrawals to maintain water levels in management areas for mast producing green tree reservoirs and duck resting areas, and to replenish lakes for sport fishing. Costs of pumps and diversion facilities included in public investment costs for Program B.
8/ Limited resource capability requires Inter-WRPA Commuting for needs satisfaction.
9/ Includes forests in WRPA 1.

Table 129 - Flood Control Plan, Structural Measures, Regional Development Program, Lower Mississippi Region

		PRINCIPAL STREAMS											
		Reservoirs - Flood Control Storage (Acre-Feet) PROGRAM						Channel Improvement (Miles) PROGRAM			Levees (Miles) PROGRAM		
		Authorized		Proposed		Total							
WRPA	Time Frame	Number	Storage	Number	Storage	Number	Storage	Authorized	Proposed	Total	Authorized	Proposed	Total
1	1980	0	0	0	0	0	0	1/	0	1/	2/	0	2/
	2000	0	0	0	0	0	0		0			0	
	2020	0	0	0	0	0	0		0			0	
	TOTAL	0	0	0	0	0	0		0			0	
2	1980	0	0	0	0	0	0	702.5	54.9	757.4	0	5.9	5.9
	2000	0	0	0	0	0	0	399.2	181.0	580.2	9.7	0	9.7
	2020	0	0	0	0	0	0	122.0	140.0	262.0	0	0	0
	TOTAL	0	0	0	0	0	0	1,223.7	375.9	1,599.6	9.7	5.9	15.6
3	1980	0	0	1	18,000	1	18,000	215.3	102.9	318.2	7.7	46.9	54.6
	2000	0	0	0	0	0	0	0	71.7	71.7	0	122.3	122.3
	2020	0	0	0	0	0	0	0	50.7	50.7	0	0	0
	TOTAL	0	0	1	18,000	1	18,000	215.3	225.3	440.6	7.7	169.2	176.9
4	1980	0	0	0	0	0	0	338.3	590.0	928.3	356.4	3.0	359.4
	2000	0	0	0	0	0	0	45.4	177.7	223.1	14.3	141.8	156.1
	2020	0	0	0	0	0	0	0	590.0	590.0	0	0	0
	TOTAL	0	0	0	0	0	0	383.7	1,357.7	1,741.4	370.7	144.8	515.5
5	1980	10	239,000	1	211,000	11	450,000	66.0	3.0	69.0	78.0	74.9	152.9
	2000	0	0	1	80,000	1	80,000	0	258.9	258.9	59.0	129,7	188.7
	2020	0	0	0	0	0	0	0	46.0	46.0	0.0	2.0	2.0
	TOTAL	10	239,000	2	291,000	12	530,000	66.0	307.9	373.9	137.0	206.6	343.6
6	1980	0	0	0	0	0	0	266.7	0	266.7	0	0	0
	2000	0	0	0	0	0	0	0	264.6	264.6	0	1.5	1.5
	2020	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	266.7	264.6	531.3	0	1.5	1.5
7	1980	0	0	0	0	0	0	0	12.0	12.0	0	12.4	12.4
	2000	0	0	0	0	0	0	0	0	0	0	7.0	7.0
	2020	0	0	0	0	0	0	0	0	0	0	11.0	11.0
	TOTAL	0	0	0	0	0	0	0	12.0	12.0	0	30.4	30.4
8	1980	0	0	0	0	0	0	0	6.0	6.0	0	0	0
	2000	0	0	0	0	0	0	0	3.0	3.0	0	0	0
	2020	0	0	0	0	0	0	0	3.0	3.0	0	10.5	10.5
	TOTAL	0	0	0	0	0	0	0	12.0	12.0	0	10.5	10.5
9	1980	0	0	0	0	0	0	83.0	80,0	163.0	0	13.5	13.5
	2000	0	0	0	0	0	0	0	0	0	0	13.9	13.9
	2020	0	0	0	0	0	0	0	0	0	0	62.0	62.0
	TOTAL	0	0	0	0	0	0	83.0	80.0	163.0	0	89.4	89.4
10	1980	0	0	0	0	0	0	0	0	0	0	20.0 3/	20.0 3/
	2000	0	0	0	0	0	0	0	0	0	0	61.6	61.6
	2020	0	0	0	0	0	0	0	0	0	0	44.0	44.0
	TOTAL	0	0	0	0	0	0	0	0	0	00	125.6	125.6
LMR	1980	10	239,000	2	229,000	12	468,000	1,671.8	848.2	2,320.6	442.1	176.6	618.7
	2000	0	0	1	80,000	1	80,000	444.6	956.9	1,401.5	83.0	477.8	560.8
	2020	0	0	0	0	0	0	122.0	829.7	951.7	0	129.5	129.5
	TOTAL	10	239,000	3	309,000	13	548,000	2,238.4	2,635.4	4,673.8	525.1	783.9	1,309.0

1/ Continuing long-term construction, Main-stem Mississippi River, underway.
2/ Eight hundred miles of levee to be raised to grade and section; 28.3 miles yet to be constructed in Mississippi River Levee and Floodway System.
3/ In addition, 7.6 miles of vegetated sand-dune and 1/2 mile jetty proposed for vicinity of Grand Isle hurricane protection.

Table 129 - Flood Control Plan, Structural Measures, Regional Development Program, Lower Mississippi Region (cont'd)

WRPA	Time Frame	PRINCIPAL STREAMS: Pumping Stations PROGRAM Authorized	Pumping Stations PROGRAM Proposed	Pumping Stations Total	Other: Locks Proposed	Other: Diversion Structures Authorized	Other: Low Flow Structures Authorized	UPSTREAM WATERSHEDS 4/: Floodwater Retarding Structures Proposed Number	Floodwater Retarding Structures Proposed Storage	Channel Improvements (Miles) Proposed	Other Proposed
1	1980	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0
2	1980	2	3	5	0	0	0	268	148,612	4,878	6/
	2000	0	3	3	0	0	0	0	0	130	6/
	2020	0	0	0	0	0	0	5	11,241	95	0
	TOTAL	2	6	8	0	0	0	273	159,853	5,103	6/
3	1980	6	1	7	0	0	0	201	244,400	660	6/
	2000	0	2	2	0	0	0	120	133,916	454	6/
	2020	0	0	0	0	0	0	92	99,070	269	6/
	TOTAL	6	3	9	0	0	0	413	477,386	1,383	6/
4	1980	0	1	1	0	0	0	53	41,594	3,674	0
	2000	0	18	18	0	0	0	16	18,146	18	0
	2020	0	0	0	0	0	0	12	10,866	1,146	0
	TOTAL	0	19	19	0	0	0	81	70,606	4,838	0
5	1980	1	2	3	0	0	0	116	209,219	389	6/
	2000	0	6	6	0	0	0	2	15,400	146	6/
	2020	0	1	1	0	0	0	50	101,037	301	0
	TOTAL	1	9	10	0	0	0	168	325,656	836	6/
6	1980	1	0	1	0	0	0	0	0	2,026	6/
	2000	0	1	1	0	0	0	0	0	325	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	1	1	2	0	0	0	0	0	2,351	6/
7	1980	0	1	1	0	0	0	284	423,335	1,157	0
	2000	0	2	2	0	0	0	94	141,543	163	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	3	3	0	0	0	378	564,878	1,320	0
8	1980	0	0	0	0	0	0	55	104,224	983	1 Pumping Plant
	2000	0	0	0	0	0	0	98	169,374	368	0
	2020	0	2	2	0	0	0	12	36,753	0	0
	TOTAL	0	2	2	0	0	0	165	310,351	1,351	1 Pumping Plant
9	1980	0	0	0	0	1	1	0	0	2,875	6 Water Control Struc.
	2000	0	0	0	0	2	0	0	0	511	0
	2020	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	2	1	1	0	0	3,386	6 Water Control Struc.
10	1980	0	5	5	0	0	0	0	0	505	100 Water Control Str.
	2000	0	17	17	5	0	0	3	13,111	344	50 Miles Levees
	2020	0	3	3	0	0	0	0	0	40	0
	TOTAL	0	25	25	5	0	0	3	13,111	889	Above
LMR	1980	10	13	23	0	1	1	977	1,171,384	17,147	
	2000	0	49	49	7	0	0	333	491,490	2,459	(See above)
	2020	0	6	6	0	0	0	171	258,967	1,851	
	TOTAL	10	68	78	7	1	1	1,481	1,921,841	21,457	

4/ Authorized projects in upstream watersheds are counted as "existing" projects and are not shown here.
5/ Primarily for hurricane protection. Other hurricane protection measures included in levees, channels, and pump plants.
6/ Unspecified number of water control structures.

improvements would be justified in the 1980-2000 time frame as opposed to the 2000-2020 time frame under Program A; and some projects proposed for the 1980-2000 time frames under Program A are shifted to the 1970-1980 time period. These shifts are viewed as a direct result of an increase in economic acitivity foreseen under the Regional Development objective. They could also be viewed as major contributors to achievement of the desired regional development levels of economic productivity and employment. This is because projects which would become feasible at an earlier date under the Regional Development Program would allow otherwise lost capital to move into the expansion sector, creating more employment, income, and a higher standard of living in this region. Damages prevented by the program, residual damages, and program effectiveness are shown in tables 130, 131, and 132, respectively.

Sediment and Erosion. Plans for the control of sediment and erosion problems are the same for both the National Income and Regional Development Programs. This matter is discussed on pages 285 through 288, and the sediment and erosion plan is summarized in table 111.

Drainage. The drainage plan for the Regional Development Program employs the same measures as the National Income Program. However, it requires more intensive watershed management, more on-farm drains, and more project channels for drainage. The Regional Development plan is summarized in table 133.

Water Quality Management. The water quality plan developed for the Regional Development objective is summarized in table 134. The plan components parallel those adopted for the National Income Program, but are scaled larger to handle the municipal, industrial, and agricultural waste loadings expected under conditions of accelerated regional development.

Navigation. The navigation plan for the Regional Development Program differs from the National Income Program only to the extent that the timing for the proposed rehabilitation of existing locks and construction of new locks in WRPA's 8, 9, and 10 has been accelerated. The Regional Development plan is given in table 135.

Hydropower. The hydropower plan for the Regional Development objective is identical to the National Income plan discussed on pages 298 through 303. The nature of future power loads indicates that all conventional hydroelectric power that can feasibly be developed within the region under either program can be marketed in the power area of which the region is a part.

Other Program B Components. Coastal and estuarine, archeological and historical, and health aspects plans are common to the Regional Development Program and the alternative programs. These plans are discussed in detail in connection with the recommended framework program (see pages 428 through 443).

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Table 130 - Average Annual Flood Damages Prevented ($1,000) by Flood Control Plan,1/ Regional Development Objective, Lower Mississippi Region

	Principal Streams									Upstream Watersheds								
	1980			2000			2020			1980			2000			2020		
WRPA	Urban	Non-Urban	Total	Urban	Non-Urban	Total	Urban	Non-Urban	Total	Urban	Non-Urban	Total	Urban	Non-Urban	Total	Urban	Non-Urban	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1,751	7,645	9,396	4,103	14,776	18,879	8,924	17,339	26,263	3	26,496	26,499	6	38,490	38,496	10	50,064	50,074
3	4,445	1,749	6,194	8,056	3,108	11,164	15,900	3,891	19,791	1,156	2,844	4,000	2,161	5,898	8,059	5,447	9,518	14,965
4	698	9,669	10,367	1,718	15,479	17,197	2,506	21,337	23,843	1	15,832	15,833	2	20,575	20,577	4	29,849	29,853
5	599	1,685	2,284	1,121	4,526	5,647	1,779	5,684	7,463	84	9,661	9,745	234	14,025	14,259	447	17,344	17,791
6	1	812	813	49	1,906	1,955	58	2,078	2,136	0	12,804	12,804	54	17,602	17,656	104	21,357	21,461
7	19	191	210	485	239	724	662	282	944	0	2,744	2,744	33	3,967	4,000	62	5,378	5,440
8	0	18	18	33	21	54	293	31	324	900	1,967	2,867	2,011	3,700	5,711	3,607	5,142	8,749
9	466	334	800	1,219	392	1,611	2,147	505	2,652	50	5,331	5,381	109	7,682	7,791	201	9,150	9,351
10	1,141	0	1,141	5,582	0	5,582	10,418	0	10,418	810	1,607	2,417	1,457	3,974	5,431	2,536	4,665	7,201
LMR	9,120	22,103	31,223	22,366	40,447	62,813	42,687	51,147	93,834	3,004	79,286	82,290	6,067	115,913	121,980	12,418	152,467	164,885

1/ As shown in table 127 only. Completion of entire backlog of projects now under construction not reflected in figures.

Table 131 - Residual Average Annual Flood Damages ($1,000), with Flood Control Plan in Place, Regional Development Objective, Lower Mississippi Region

Planning Area	1980 Principal Streams	1980 Upstream Watersheds	1980 Total	2000 Principal Streams	2000 Upstream Watersheds	2000 Total	2020 Principal Streams	2020 Upstream Watersheds	2020 Total
1	4,423	0	4,423	4,962	0	4,962	5,754	0	5,754
2	29,447	15,680	45,127	24,005	18,618	42,623	31,204	23,003	54,207
3	12,399	6,522	18,921	17,809	7,359	25,168	26,978	7,022	34,000
4	10,626	13,193	23,819	10,565	16,944	27,509	12,335	16,223	28,558
5	6,028	7,660	13,688	4,986	9,762	14,748	5,950	12,202	18,152
6	3,746	7,195	10,941	3,132	8,315	11,447	3,136	10,116	13,252
7	2,337	1,847	4,184	2,885	1,992	4,877	4,090	2,684	6,774
8	1,329	2,326	3,655	2,060	1,873	3,933	3,133	2,392	5,525
9	4,789	5,089	9,878	5,102	5,670	10,772	5,410	6,779	12,189
10	33,249	3,945	37,194	48,019	3,333	51,352	71,916	3,899	75,815
LMR	108,373	63,457	171,830	123,525	73,866	197,391	169,906	84,320	254,226

Table 132- Effectiveness of Flood Control Plan, Regional Development Program, Lower Mississippi Region

WRPA	Damages Prevented in 2020 Urban	Non-Urban
	(Percent)	
1	-	-
2	85	54
3	49	54
4	76	65
5	64	58
6	44	64
7	22	57
8	57	68
9	49	50
10	16	38
LMR	48	58

Summary of Regional Development Program

A composite of the plans that make up the Regional Development Program is given in table 136. The included plans are as stated earlier, not intended to induce regional development; they are merely responsive to identified resource development needs that could arise therefrom. Hence, the Regional Development Program is in essence a large-scale version of the National Income Program.

Table 133- Drainage Plan, RD Objective, Lower Mississippi Region

WRPA/Time Frame		Structural Measures: On Farm Drains (Miles): V and W Ditches: Incremental	Cumulative	Secondary Ditches: Incremental	Cumulative	Subtotal: Incremental	Cumulative	Project Channels for Drainage (Miles)[2/]: Incremental	Cumulative	Total Drains and Channels: Incremental	Cumulative	Nonstructural Measures[1/]: Watershed Management (Acres): Incremental	Cumulative
2	1980	1,730	1,730	1,040	1,040	2,770	2,770	2,630	2,630	5,400	5,400	519,700	519,700
	2000	3,470	5,200	2,080	3,120	5,550	8,320	20	2,650	5,570	10,970	1,039,400	1,559 100
	2020	3,470	8,670	2,080	5,200	5,550	13,870	70	2,720	5,620	16,590	1,039,400	2,598,500
3	1980	70	70	45	45	115	115	50	50	165	165	22,000	22,000
	2000	150	220	90	135	240	355	100	150	340	505	43,900	65,900
	2020	150	370	90	225	240	595	100	250	340	845	44,000	109,900
4	1980	1,160	1,160	700	700	1,860	1,860	2,870	2,870	4,730	4,730	346,900	346,900
	2000	2,300	3,460	1,380	2,080	3,680	5,540	0	2,870	3,680	8,410	693,900	1,040,800
	2020	2,300	5,760	1,380	3,460	3,680	9,220	0	2,870	3,680	12,090	693,800	1,734,600
5	1980	390	390	240	240	630	630	320	320	950	950	119,000	119,000
	2000	770	1,160	460	700	1,230	1,860	120	440	1,350	2,300	237,900	356,900
	2020	750	1,910	460	1,160	1,210	3,070	220	660	1,430	3,730	238,000	594,900
6	1980	540	540	330	330	870	870	910	910	1,780	1,780	163,600	163,600
	2000	1,060	1,600	640	970	1,700	2,570	220	1,130	1,920	3,700	327,300	490,900
	2020	1,070	2,670	640	1,610	1,710	4,280	0	1,130	1,710	3,410	327,400	818,300
7	1980	100	100	60	60	160	160	370	370	530	530	28,300	28,300
	2000	170	270	110	170	280	440	60	430	340	870	56,600	84,900
	2020	180	450	110	280	290	730	0	430	290	1,160	56,600	141,500
8	1980	80	80	50	50	130	130	530	530	660	660	25,100	25,100
	2000	140	220	90	140	230	360	200	730	430	1,090	50,200	75,300
	2020	150	370	90	230	240	600	0	730	240	1,330	50,200	125,500
9	1980	740	740	450	450	1,190	1,190	1,400	1,400	2,590	2,590	228,700	228,700
	2000	1,460	2,200	890	1,340	2,350	3,540	250	1,650	2,600	5,190	457,300	686,000
	2020	1,450	3,650	880	2,220	2,330	5,870	0	1,650	2,330	7,520	457,400	1,143,400
10	1980	90	90	60	60	150	150	350	350	500	500	29,200	29,200
	2000	180	270	110	170	290	440	170	520	460	960	58,200	87,400
	2020	170	440	100	270	270	710	40	560	310	1,270	58,300	145,700
LMR	1980	4,900	4,900	2,975	2,975	7,875	7,875	9,430	9,430	17,305	17,305	1,482,500	1,482,500
	2000	9,700	14,600	5,850	8,825	15,550	23,425	1,140	10,570	16,690	33,995	2,964,700	4,447,200
	2020	9,690	24,290	5,830	14,655	15,520	38,945	430	11,000	15,950	49,945	2,965,100	7,412,300

1/ Measures additional to those existing in 1970.
2/ Drainage channels included in Flood Control Plan for upstream watersheds.

Table 134 - Water Quality Plan, Program B, Lower Mississippi Region

Municipal and Industrial Organic Wastes

WRPA	Time Frame	Municipal: Gross BOD_5 Loading (1,000 lbs.)	Municipal: BOD_5 Removal (1,000 lbs.): Existing Treatment 1/	Municipal: BOD_5 Removal: Proposed Treatment 2/	Municipal: BOD_5 Removal: Stream Assimilation 3/	Municipal: BOD_5 Removal: Mechanical Reaeration	Municipal: Remaining BOD_5 Load (1,000 lbs.)	Industrial: Gross BOD_5 Loading (1,000 lbs.)	Industrial: BOD_5 Removal (1,000 lbs.): Existing Treatment 1/	Industrial: BOD_5 Removal: Proposed Treatment 4/	Industrial: BOD_5 Removal: Stream Assimilation 3/	Industrial: BOD_5 Removal: Mechanical Reaeration	Industrial: Remaining BOD_5 Load (1,000 lbs.)
2	1980	66	43	18	3	2	0	49	21	28	0	0	0
	2000	92	43	48	1	0	0	89	21	68	0	0	0
	2020	132	43	86	2	1	0	169	21	147	1	0	0
3	1980	211	34	157	19	1	0	539	192	338	8	1	0
	2000	328	34	288	6	0	0	1,109	192	898	15	4	0
	2020	467	34	425	8	0	0	2,023	192	1,796	26	9	0
4	1980	58	23	29	5	1	0	122	51	66	4	1	0
	2000	80	23	55	1	1	0	224	51	168	4	1	0
	2020	110	23	84	2	1	0	451	51	382	17	1	0
5	1980	84	46	31	5	2	0	1,153	456	672	24	1	0
	2000	122	46	74	1	1	0	2,157	456	1,678	22	1	0
	2020	167	46	118	2	1	0	4,290	456	3,789	43	2	0
6	1980	17	8	7	1	1	0	196	92	98	0	6	0
	2000	19	8	10	0	1	0	338	92	241	0	5	0
	2020	23	8	14	0	1	0	646	92	543	0	11	0
7	1980	11	4	6	1	0	0	247	99	138	10	0	0
	2000	15	4	11	0	0	0	459	99	351	9	0	0
	2020	20	4	16	0	0	0	903	99	786	18	0	0
8	1980	62	23	32	7	0	0	558	197	343	18	0	0
	2000	94	23	69	2	0	0	1,120	197	905	18	0	0
	2020	131	23	105	3	0	0	2,294	197	2,059	38	0	0
9	1980	96	40	45	7	4	0	551	223	312	4	12	0
	2000	130	40	87	2	1	0	961	223	724	7	7	0
	2020	162	40	118	3	1	0	1,747	223	1,499	10	15	0
10	1980	239	92	124	21	2	0	804	289	495	18	2	0
	2000	377	92	279	5	1	0	1,535	289	1,227	17	2	0
	2020	444	92	343	8	1	0	2,997	289	2,671	34	3	0
LMR	1980	844	313	449	69	13	0	4,219	1,620	2,490	86	23	0
	2000	1,257	313	921	18	5	0	7,992	1,620	6,260	92	20	0
	2020	1,656	313	1,309	28	6	0	15,520	1,620	13,672	187	41	0

1/ Treatment level as of 1970.
2/ Conventional secondary treatment to achieve 90 percent BOD_5 removal by 1980, and advanced treatment to achieve 98 percent removal by 2000, with continued 98 percent removal through 2020.
3/ Assimilative capacity of receiving streams at point sources of effluent discharges.
4/ Conventional secondary treatment to achieve 96 percent BOD_5 removal (equivalent to 90 percent for municipalities) by 1980, and advance treatment to achieve 98 percent removal by 2000, with continued 98 percent removal through 2020.

Table 134- Water Quality Plan, Program B, Lower Mississippi Region (cont'd)

WRPA/Time Frame		Agricultural Organic Wastes: Gross BOD_5 Wastes 5/ (1,000 lbs.)	Waste Assimilation (1,000 lbs.): Existing 6/	Waste Assimilation (1,000 lbs.): Potential 7/	Potential Discharge To Streams 8/ (1,000 lbs.)	Proposed Treatment 9/ (1,000 lbs.)	Remaining BOD_5 Discharge (1,000 lbs.)	Inorganic Wastes: Bacteriological Wastes: Bacterial Effluent Discharge (mgd)	Bacteria Control (mgd): Existing Chlorination 10/	Bacteria Control (mgd): Proposed Chlorination	Unchlorinated Discharge (mgd)	Other Pollutants
2	1980	711	553	130	28	28	0	46.9	3.5	43.4	0	11/
	2000	1,010	553	417	40	40	0	67.3	3.5	63.8	0	11/
	2020	1,356	553	751	52	52	0	100.7	3.5	97.2	0	11/
3	1980	1,004	785	175	44	44	0	154.8	27.3	127.5	0	11/
	2000	1,436	785	589	62	62	0	246.1	27.3	218.8	0	11/
	2020	1,905	785	1,040	80	80	0	357.2	27.3	329.9	0	11/
4	1980	1,123	863	221	39	39	0	54.4	4.0	50.4	0	11/
	2000	1,588	863	674	51	51	0	76.5	4.0	72.5	0	11/
	2020	2,114	863	1,184	67	67	0	105.2	4.0	101.2	0	11/
5	1980	1,367	1,009	292	66	66	0	46.4	19.0	27.4	0	11/
	2000	1,994	1,009	889	96	96	0	65.9	19.0	46.9	0	11/
	2020	2,664	1,009	1,527	128	128	0	94.4	19.0	75.4	0	11/
6	1980	462	361	90	11	11	0	7.3	4.6	2.7	0	11/
	2000	665	361	289	15	15	0	8.3	4.6	3.7	0	11/
	2020	889	361	508	20	20	0	10.5	4.6	5.9	0	11/
7	1980	580	443	114	23	23	0	8.9	1.9	7.0	0	11/
	2000	837	443	361	33	33	0	12.6	1.9	10.7	0	11/
	2020	1,113	443	627	43	43	0	17.8	1.9	15.9	0	11/
8	1980	622	500	98	24	24	0	49.1	25.2	23.9	0	11/
	2000	886	500	352	34	34	0	77.8	25.2	52.6	0	11/
	2020	1,167	500	623	44	44	0	115.4	25.2	90.2	0	11/
9	1980	834	659	149	26	26	0	81.8	44.5	37.3	0	11/
	2000	1,194	659	499	36	36	0	120.0	44.5	75.5	0	11/
	2020	1,588	659	882	47	47	0	160.8	44.5	116.3	0	11/
10	1980	112	88	21	3	3	0	225.4	134.7	90.7	0	11/
	2000	161	88	68	5	5	0	304.1	134.7	169.4	0	11/
	2020	214	88	120	6	6	0	396.1	134.7	261.4	0	11/
LMR	1980	6,815	5,261	1,290	264	264	0	675.0	264.7	410.3	0	11/
	2000	9,771	5,261	4,138	372	372	0	978.6	264.7	713.9	0	11/
	2020	13,010	5,261	7,262	487	487	0	1358.1	264.7	1093.4	0	11/

5/ Organic waste from livestock and poultry including both point sources and non-point sources.
6/ Organic waste disposal as of 1970 by such methods as direct land application, recycling, aerated lagoon-irrigation systems, holding tanks, or some combination of these.
7/ Expected in addition to 1970 disposal in the absence of NI Program measures.
8/ Waste discharges entering surface waters as equivalent point sources of pollution.
9/ Treatment consisting of the application of solid wastes to productive cropland at a rate which will provide nutrients that can be fully utilized by the crops.
10/ Treatment level as of 1970.
11/ Treatment of inorganic sediments included in sediment and erosion plan. Treatment of other pollutants (thermal wastes, heavy metals, nutrients, toxics, odor, color, phenolics, pH, oil and grease, etc.) unspecified due to a lack of data.

Table 135 - Navigation Plan, Program B, Lower Mississippi Region

		Navigation Waterways (Miles)								Navigation Locks (Number)	
		Deep Draft Channels				Shallow Draft Channels					
WRPA	Time Frame	Existing1/	Authorized2/	Proposed2/	Total	Existing1/	Authorized2/	Proposed2/	Total	Existing1/	Authorized2/
1	1980	271	0	228(228)	271	720	718(718)	0	720	0	0
	2000			0	271			0	720		
	2020			0	271			0	720		
2	1980	0	0	0	0	328	0	200	528	4	0
	2000			0	0			0	528		
	2020			0	0			0	528		
3	1980	0	0	0	0	0	0	0	0	0	0
	2000			0	0			0	0		
	2020			0	0			0	0		
4	1980	0	0	0	0	189	163(163)	0	189	0	1
	2000			0	0			0	189		
	2020			0	0			0	189		
5	1980	0	0	0	0	351	0	0	351	4	0
	2000			0	0			0	351		
	2020			0	0			0	351		
6	1980	0	0	0	0	0	0	0	0	0	0
	2000			0	0			0	0		
	2020			0	0			0	0		
7	1980	0	0	0	0	0	0	0	0	0	0
	2000			0	0			0	0		
	2020			0	0			0	0		
8	1980	0	0	0	0	273	0	0	273	2	0
	2000			0	0			0	273		
	2020			0	0			0	273		
9	1980	100	3(3)	6(6)	100	705	238(238)	84(84)	705	4	1(1)
	2000			34(34)	100			270(255)	720		
	2020			200	300			0	720		
10	1980	81	55(3)	50(50)	133	400	182(96)	97(97)	486	6	1(1)
	2000			0	133			188(188)	486		
	2020			0	133			0	486		
LMR	1980	452	58(6)	284(284)	504	2,966	1,301(1,215)	381(181)	3,252	20	3(2)
	2000			34(34)	504			458(443)	3,267		
	2020			200	504			0	3,267		

1/ Active Federal projects and projects under construction as of 1970. Does not include existing private port facilities or Federal projects on which maintenance has been discontinued.
2/ Includes both new facilities and improvement of existing facilities. Total given first, with improvement indicated in parentheses. Proposed facilities are additional to existing and authorized facilities.

Table 135 - Navigation Plan, Program B, Lower Mississippi Region (cont'd)

WRPA	Time Frame	Navigation Locks (Number)		Navigation Ports (Number)							
				Deep Draft				Shallow Draft			
		Proposed 2/	Total	Existing 1/	Authorized 2/	Proposed 2/	Total	Existing 1/	Authorized 2/	Proposed 2/	Total
1	1980	0	0	3/	3/	3/	3/	3/	3/	3/	3/
	2000	0	0			3/	3/			3/	3/
	2020	0	0			3/	3/			3/	3/
2	1980	0	4	0	0	0	0	4	0	2(1)	5
	2000	0	4			0	0			6(1)	10
	2020	0	4			0	0			1	11
3	1980	0	0	0	0	0	0	3	0	1(1)	3
	2000	0	0			0	0			1(1)	3
	2020	0	0			0	0			0	3
4	1980	1	2	0	0	0	0	3	0	7(3)	7
	2000	0	2			0	0			1(1)	7
	2020	0	2			0	0			2(2)	7
5	1980	2	6	0	0	0	0	1	0	5	6
	2000	0	6			0	0			2(1)	7
	2020	0	6			0	0			2	9
6	1980	0	0	0	0	0	0	1	0	3(1)	3
	2000	0	0			0	0			0	3
	2020	0	0			0	0			1(1)	3
7	1980	0	0	0	0	0	0	1	0	0	1
	2000	0	0			0	0			1(1)	1
	2020	0	0			0	0			0	1
8	1980	0	2	1	0	0	1	0	0	0	0
	2000	3(1)	4			0	1			0	0
	2020	0	4			0	1			0	0
9	1980	3(1)	6	2	0	0	2	0	0	0	0
	2000	1(1)	6			0	2			0	0
	2020	0	6			0	2			0	0
10	1980	1	7	1	0	0	1	0	0	0	0
	2000	4(2)	9			0	1			0	0
	2020	1(1)	9			0	1			0	0
LMR	1980	7(1)	27	4	0	1 4/	5 4/	13	0	18(6)	25
	2000	8(4)	31			0	5 4/			11(5)	31
	2020	1(1)	31			0	5 4/			6(3)	34

3/ Mississippi River ports listed with WRPA ports.
4/ Includes superport in Gulf Coast area.

Table 136 - Program B Composition, Lower Mississippi Region

Planning Area & Time Frame	Water Supply (mgd)			Water Surface Area			Land (1,000 Acres)			
	Municipal	Fish & Wildlife	Total	Recreation (1,000 Acres)	Fish & Wildlife (Miles)[1/]	Natural Environment (1,000 Acres)	Recreation	Fish & Wildlife	Natural Environment	Total
WRPA 1										
1970-1980	0.0	0.0	0.0	0.0	3/	4.0	0.0	0.0	6.0	6.0
1980-2000	0.0	0.0	0.0	0.0	3/	0.0	0.0	0.0	0.0	0.0
2000-2020	0.0	0.0	0.0	0.0	3/	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	3/	4.0	0.0	0.0	6.0	6.0
WRPA 2										
1970-1980	8.3	50.0	189.5[2/]	0.0	1203.0	15.0	2.0	104.0	26.1	132.1
1980-2000	20.3	110.0	157.1[2/]	17.0	0.0	0.0	4.7	93.7	0.0	98.4
2000-2020	32.7	110.0	142.7	58.0	0.0	0.0	13.3	141.4	0.0	154.7
Total	61.3	270.0	489.3[2/]	75.0	1203.0	15.0	20.0	339.1	26.1	385.2
WRPA 3										
1970-1980	51.1	43.0	94.1	166.0	822.0	7.0	35.1	57.2	53.3[4/]	145.6
1980-2000	123.1	86.0	209.1	200.0	0.0	0.0	29.7	56.0	0.0	85.7
2000-2020	158.5	86.0	244.5	219.0	0.0	0.0	48.0	84.8	0.0	132.8
Total	332.7	215.0	547.7	585.0	822.0	7.0	112.8	198.0	53.3	364.1
WRPA 4										
1970-1980	18.1	22.0	40.1	29.0	1100.0	3.0	8.3	92.2	13.3	113.8
1980-2000	29.9	30.0	59.9	52.0	0.0	0.0	15.3	63.3	0.0	78.6
2000-2020	38.6	34.0	72.6	55.0	0.0	0.0	20.9	95.7	0.0	116.6
Total	86.6	86.0	172.6	136.0	1100.0	3.0	44.5	251.2	13.3	309.0
WRPA 5										
1970-1980	15.7	31.0	46.7	0.0	1931.0	4.0	10.7	103.5	33.0[4/]	147.2
1980-2000	31.9	60.0	91.9	0.0	0.0	0.0	22.9	88.9	0.0	111.8
2000-2020	50.3	62.0	112.3	184.0	0.0	0.0	32.9	134.4	0.0	167.3
Total	97.9	153.0	250.9	184.0	1931.0	4.0	66.5	326.8	33.0	426.3
WRPA 6										
1970-1980	1.7	8.0	9.7	0.0	536.0	1.0	4.1	25.0	3.0[4/]	32.1
1980-2000	2.1	16.0	18.1	4.0	0.0	0.0	1.4	17.2	0.0	18.6
2000-2020	4.3	17.0	21.3	11.0	0.0	0.0	2.6	26.1	0.0	28.7
Total	8.1	41.0	49.1	15.0	536.0	1.0	8.1	68.3	3.0	79.4
WRPA 7										
1970-1980	5.0	2.0	7.0	0.0	450.0	4.0	3.7	30.0	24.9[4/]	58.6
1980-2000	8.7	6.0	14.7	0.0	0.0	0.0	2.6	25.6	0.0	28.2
2000-2020	12.6	5.0	17.6	0.0	0.0	0.0	3.1	38.6	0.0	41.7
Total	26.3	13.0	39.3	0.0	450.0	4.0	9.4	94.2	24.9	128.5
WRPA 8										
1970-1980	22.5	2.0	24.5	0.0	400.0	2.0	16.2	14.0	19.1[4/]	49.3
1980-2000	43.8	3.0	46.8	0.0	0.0	0.0	7.9	4.7	0.0	12.6
2000-2020	57.3	4.0	61.3	36.0	0.0	0.0	12.0	7.0	0.0	19.0
Total	123.6	9.0	132.6	36.0	400.0	2.0	36.1	25.7	19.1	80.9
WRPA 9										
1970-1980	26.2	73.0	99.2	0.0	928.0	1.0	19.3	27.0	16.5[4/]	62.8
1980-2000	44.7	188.0	434.7	0.0	0.0	0.0	7.4	176.2	0.0	183.6
2000-2020	46.0	120.0	430.0	0.0	0.0	0.0	9.2	266.4	0.0	275.6
Total	116.9	381.0	963.9[2/]	0.0	928.0	1.0	35.9	469.6	16.5	522.0
WRPA 10										
1970-1980	53.1	0.0	53.1	0.0	329.0	0.0	40.9	11.0	22.7[4/]	74.6
1980-2000	108.1	2.0	110.1	0.0	0.0	0.0	18.8	48.3	0.0	67.1
2000-2020	140.0	1.0	141.0	0.0	0.0	0.0	28.7	72.7	0.0	101.4
Total	301.2	3.0	304.2	0.0	329.0	0.0	88.4	132.0	22.7	243.1
Region										
1970-1980	201.7	231.0	563.9[2/]	195.0	7699.0	41.0	140.3	463.9	217.8	822.0
1980-2000	412.6	501.0	1142.4[2/]	273.0	0.0	0.0	110.2	573.9	0.0	684.1
2000-2020	540.3	439.0	1243.3[2/]	563.0	0.0	0.0	170.7	867.1	0.0	1037.8
Total	1154.6	1171.0	2949.6[2/]	1031.0	7699.0	41.0	421.2	1904.9	217.8	2543.9

1/ Stream miles.
2/ Includes irrigation withdrawals.
3/ The main stem of the Mississippi River is not considered quality stream fishing in the fish and wildlife context involved here. However, access is provided (though no mileage is given) and costs are included in the program (shared equally by recreation) for this access which will make the Mississippi River available to residents of adjoining WRPA's for limited fishing and recreation activities.
4/ Provides all or part of Class A recreation lands for 2000 and 2020.

Table 136 - Program B Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Land Treatment 6/ (1,000 Acres)	Sediment and Erosion Control: Streambanks (Miles)	Sediment and Erosion Control: Roadbanks (Miles)	Sediment and Erosion Control: Total (Miles)	Drainage: Watershed Management (1,000 Acres)	Drainage: Channels (Miles)	Municipal Water Quality Control: Secondary Treatment (1000 lb.) BOD_5	Municipal Water Quality Control: Advance Treatment (1000 lb.) BOD_5	Municipal Water Quality Control: Other 7/ (1000 lb.) BOD_5	Municipal Water Quality Control: Bacteria Control 8/ (mgd)
WRPA 1										
1970-1980	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
1980-2000	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
2000-2020	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
WRPA 2										
1970-1980	3958.5	128	441	569	519.7	5400.0	18.0		5.0	43.4
1980-2000	4323.6	49	386	435	1039.4	5570.0	0	48.0	1.0	20.4
2000-2020	4732.7	36	275	311	1039.4	5620.0	0	86.0	3.0	33.4
Total	13,014.8	213	1102	1315	2598.5	16,590.0	-	-	-	97.2
WRPA 3										
1970-1980	2936.3	369	554	923	22.0	165.0	157.0	0	20.0	127.5
1980-2000	3043.5	222	485	707	43.9	340.0	0	288.0	6.0	91.3
2000-2020	3371.8	152	346	498	44.0	340.0	0	425.0	8.0	111.1
Total	9351.6	743	1385	2128	109.9	845.0	-	-	-	329.9
WRPA 4										
1970-1980	3986.1	266	806	1072	346.9	4730.0	29.0	0	6.0	50.4
1980-2000	4304.5	191	705	896	693.9	3680.0	0	55.0	2.0	22.1
2000-2020	4670.5	143	503	646	693.8	3680.0	0	84.0	3.0	28.7
Total	12,961.1	600	2014	2614	1734.6	12,090.0	-	-	-	101.2
WRPA 5										
1970-1980	3578.8	76	1174	1250	119.0	950.0	31.0	0	7.0	27.4
1980-2000	3770.0	50	1028	1078	237.9	1350.0	0	74.0	2.0	19.5
2000-2020	4273.3	35	734	769	238.0	1430.0	0	118.0	3.0	28.5
Total	11,604.1	161	2936	3097	594.9	3730.0	-	-	-	75.4
WRPA 6										
1970-1980	1509.3	42	165	207	131.7	1460.0	7.0	0	2.0	2.7
1980-2000	1626.2	37	145	182	263.4	1560.0	0	10.0	1.0	1.0
2000-2020	1813.2	28	103	131	263.4	1350.0	0	14.0	1.0	2.2
Total	4948.7	107	413	520	658.5	4370.0	-	-	-	5.9
WRPA 7										
1970-1980	1445.9	106	524	630	21.4	410.0	6.0	0	1.0	7.0
1980-2000	1393.1	67	458	525	42.8	250.0	0	11.0	0	3.7
2000-2020	1595.4	44	327	371	42.8	230.0	0	16.0	1.0	5.2
Total	4434.4	217	1309	1526	107.0	890.0	-	-	-	15.9
WRPA 8										
1970-1980	920.9	40	232	272	20.8	540.0	32.0	0	7.0	23.9
1980-2000	927.7	24	203	227	41.6	390.0	0	69.0	2.0	28.7
2000-2020	1092.5	16	145	161	41.6	230.0	0	105.0	3.0	37.6
Total	2941.1	80	580	660	104.0	1160.0	-	-	-	90.2
WRPA 9										
1970-1980	2449.9	8	599	1079	196.8	2210.0	45.0	0	11.0	37.3
1980-2000	2586.5	3	524	811	393.5	2240.0	0	87.0	3.0	38.2
2000-2020	2972.6	4	374	566	393.6	2000.0	0	118.0	4.0	40.8
Total	8009.0	15	1497	2456	983.9	6450.0	-	-	-	116.3
WRPA 10										
1970-1980	819.0	2	38	40	25.8	430.0	124.0	0	23.0	90.7
1980-2000	879.1	1	33	34	51.7	420.0	0	279.0	6.0	78.7
2000-2020	912.0	1	23	24	51.6	290.0	0	343.0	9.0	92.0
Total	2610.1	4	94	98	129.1	1140.0	-	-	-	261.4
Region										
1970-1980	21,604.7	1,037	4533	6042	1296.4	15,070.0	449.0	0	82.0	410.3
1980-2000	22,836.2	644	3967	4895	2592.5	14,620.0	0	921.0	23.0	303.6
2000-2020	25,434.0	459	2830	3477	2592.7	13,920.0	0	1309.0	34.0	379.5
Total	69,874.9	2,140	11,330	14,414	6481.6	43,610.0	-	-	-	1093.4

6/ Includes land treatment to reduce flood runoff and critical area treatment to reduce sediment and erosion.
7/ Includes mechanical reaeration and stream assimilation.
8/ Chlorination.

Table 136 - Program B Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	FLOOD CONTROL									
	Principal Reaches					Upstream Watersheds				
			Reservoirs				Retarding Dams			
	Levees (Miles)	Channels (Miles)	Number	Storage (1000 Acre-Ft.)	Pumping Plants (Number)	Channels (Miles	Number	Storage (1000 Acre-Ft.)	Floodplain Management (1000 Acres)	Watershed Management (1000 Acres)
WRPA 1										
1970-1980	0.0	0.0	0	0	0	0	0	0	0	0
1980-2000	0.0	0.0	0	0	0	0	0	0	0	0
2000-2020	0.0	0.0	0	0	0	0	0	0	0	0
Total	0.0	0.0	0	0	0	0	0	0	0	0
WRPA 2										
1970-1980	5.9	641.6	0	0	5	4,878	268	149	2,236	8,034
1980-2000	9.7	618.0	0	0	3	130	0	0	87	291
2000-2020	0	340.0	0	0	0	95	5	11	92	411
Total	15.6	1599.6	0	0	8	5,103	273	160	2,415	8,736
WRPA 3										
1970-1980	7.7	292.0	1	18	7	660	201	244	293	1,929
1980-2000	169.2	51.7	0	0	2	454	120	134	111	918
2000-2020	0	96.9	0	0	0	269	92	99	115	668
Total	176.9	440.6	1	18	9	1,383	413	477	519	3,515
WRPA 4										
1970-1980	359.4	928.3	0	0	1	3,674	53	42	1,370	4,737
1980-2000	76.6	208.1	0	0	9	18	16	18	24	131
2000-2020	82.5	605.0	0	0	9	1,146	12	11	305	970
Total	518.5	1741.4	0	0	19	4,838	81	71	1,699	5,838
WRPA 5										
1970-1980	152.9	69.0	11	450	3	389	116	209	664	1,730
1980-2000	188.7	242.9	1	80	6	146	2	15	87	162
2000-2020	2.0	62.0	0	0	1	301	50	101	504	1,283
Total	343.6	373.9	12	530	10	836	168	325	1,255	3,175
WRPA 6										
1970-1980	0	266.7	0	0	1	2,026	0	0	1,465	1,876
1980-2000	1.5	159.6	0	0	1	325	0	0	111	317
2000-2020	0	105.0	0	0	0	0	0	0	0	0
Total	1.5	531.3	0	0	2	2,351	0	0	1,576	2,193
WRPA 7										
1970-1980	12.4	12.0	0	0	1	1,157	284	423	348	2,690
1980-2000	7.0	0	0	0	2	163	94	142	60	1,018
2000-2020	6.0	0	0	0	0	0	0	0	0	0
Total	25.4	12.0	0	0	3	1,320	378	565	408	3,708
WRPA 8										
1970-1980	0	6.0	0	0	0	983	55	104	734	1,505
1980-2000	0	3.0	0	0	0	368	98	169	219	1,225
2000-2020	10.5	3.0	0	0	2	0	12	37	17	443
Total	10.5	12.0	0	0	2	1,351	165	310	970	3,173
WRPA 9										
1970-1980	13.5	163.0	0	0	0	2,875	0	0	1,810	3,025
1980-2000	13.9	0	0	0	0	511	0	0	469	797
2000-2020	62.0	0	0	0	0	0	0	0	0	0
Total	89.4	163.0	0	0	0	3,386	0	0	2,279	3,822
WRPA 10										
1970-1980	20.0	0	0	0	5	505	0	0	337	669
1980-2000	61.6	0	0	0	17	344	3	13	335	530
2000-2020	44.0	0	0	0	3	40	0	0	42	42
Total	125.6	0	0	0	25	889	3	13	714	1,241
Region										
1970-1980	571.8	2378.6	12	468	22	17,147	977	1,171	9,258	26,196
1980-2000	528.2	1283.3	1	80	40	2,459	333	491	1,502	5,389
2000-2020	207.0	1211.9	0	0	15	1,851	171	259	1,074	3,819
Total	1307.0	4873.8	13	548	77	12,457	1,481	1,921	11,834	35,404

Table 156 - Program B Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Navigation Facilities: Channels (Miles): Deep Draft	Shallow Draft	Total	Harbors (Number)	Locks (Number)	Hydropower Production (MW)	Coastal & Estuarine	Archeological & Historical	Public Health
WRPA 1									
1970-1980	288.0	0	288.0	0	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	288.0	0	288.0	0	0	0	0	9/	10/
WRPA 2									
1970-1980	0	200.0	200.0	2	0	7.5	0	9/	10/
1980-2000	0	0	0	6	0	70.6	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	200.0	200.0	9	0	78.1	0	9/	10/
WRPA 3									
1970-1980	0	0	0	1	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	2	0	0	0	9/	10/
WRPA 4									
1970-1980	0	0	0	7	1	18.0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	10	1	18.0	0	9/	10/
WRPA 5									
1970-1980	0	0	0	5	2	40.0	0	9/	10/
1980-2000	0	0	0	2	0	50.0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	9	2	90.0	0	9/	10/
WRPA 6									
1970-1980	0	0	0	3	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	0	0	4	0	0	0	9/	10/
WRPA 7									
1970-1980	0	0	0	0	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	1	0	0	0	9/	10/
WRPA 8									
1970-1980	0	0	0	0	0	0	11/	9/	10/
1980-2000	0	0	0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	1	0	11/	9/	10/
Total	0	0	0	0	3	0	11/	9/	10/
WRPA 9									
1970-1980	6.5	84.0	90.5	0	2	0	11/	9/	10/
1980-2000	34.0	270.0	304.0	0	2	0	11/	9/	10/
2000-2020	200.0	0	200.0	0	0	0	11/	9/	10/
Total	240.5	354.0	594.5	0	4	0	11/	9/	10/
WRPA 10									
1970-1980	50.0	97.0	147.0	0	1	0	11/	9/	10/
1980-2000	0	188.0	188.0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	3	0	11/	9/	10/
Total	50.0	285.0	335.0	0	6	0	11/	9/	10/
Region									
1970-1980	344.5	381.0	725.5	18	6	65.5	11/	9/	10/
1980-2000	34.0	458.0	492.0	11	6	120.0	11/	9/	10/
2000-2020	200.0	0	200.0	6	4	0	11/	9/	10/
Total	578.5	839.0	1417.5	35	16	186.1	11/	9/	10/

9/ Composed of surveying, testing and excavating archeological sites, and preservation, restoration and maintenance of historic resources. See Recommended Program Composition (table 154).

10/ Composed of public drinking water programs and vector abatement districts at state level. See Recommended Program Composition (table 154).

11/ Composed of measures for salinity control, shoreline erosion control, and water level management. See Recommended Program Composition (table 154).

Program Costs

Estimated costs for the Regional Development Program are summarized in table 137. The estimates are expressed in terms of January 1972 dollars, without adjustment or discounting by time periods. The allocation of costs between Federal and non-Federal interests is in accordance with the percentages used for the National Income Program (see table 122). Certain flood control features of the ongoing Mississippi River and Tributaries Project are included in the costs, as in the case of the National Income Program.

The total investment cost of the Regional Development Program is estimated at $16.6 billion, of which half is Federal cost and half is non-Federal. Average annual operation and maintenance costs are estimated at $395 million.

Table 137 - Estimated Program Costs, Regional Summary, Regional Development Objective

Feature	1971-1980 Investment Federal	1971-1980 Investment Non-Federal	1971-1980 Annual O&M Federal	1971-1980 Annual O&M Non-Federal	1971-1980 Totals Investment	1971-1980 Totals O&M	1981-2000 Investment Federal	1981-2000 Investment Non-Federal	1981-2000 Annual O&M Federal	1981-2000 Annual O&M Non-Federal	1981-2000 Totals Investment	1981-2000 Totals O&M
Water Supply	28,614	25,841	652	14,091	54,455	14,743	160,850	65,037	4,170	32,921	225,887	37,091
Municipal	(22,664)	(22,664)	(0)	(13,213)	(45,328)	(13,213)	(55,699)	(55,699)	(0)	(24,976)	(111,398)	(24,976)
Irrigation	(2,786)	(14)	(0)	(227)	(2,800)	(227)	(98,781)	(2,969)	(1,968)	(5,743)	(101,750)	(7,711)
Fish and Wildlife	(3,164)	(3,163)	(652)	(651)	(6,327)	(1,303)	(6,370)	(6,369)	(2,202)	(2,202)	(12,739)	(4,404)
Water Surface	440,826	195,592	810	4,429	636,418	5,239	309,569	157,066	1,724	6,900	466,635	8,624
Recreation												
Small Water	(167,161)	(167,160)	(0)	(2,462)	(334,321)	(2,462)	(156,228)	(156,227)	(0)	(4,766)	(312,455)	(4,766)
Large Water	(259,299)	(14,067)	(810)	(374)	(273,366)	(1,184)	(152,500)	(0)	(1,724)	(374)	(152,500)	(2,098)
Stream Access	(2,075)	(2,075)	(0)	(415)	(4,150)	(415)	(413)	(412)	(0)	(498)	(825)	(498)
Fish and Wildlife	(5,150)	(5,150)	(0)	(1,032)	(10,300)	(1,032)	(428)	(427)	(0)	(1,116)	(855)	(1,116)
Natural Environment	(7,141)	(7,140)	(0)	(146)	(14,281)	(146)	(0)	(0)	(0)	(146)	(0)	(146)
Lands	728,964	2,981,877	53,313	55,387	3,710,841	108,700	489,040	489,040	103,625	107,995	978,080	211,620
Recreation	(583,900)	(583,900)	(53,303)	(53,302)	(1,167,800)	(106,605)	(388,625)	(388,625)	(103,615)	(103,615)	(777,250)	(207,230)
Fish and Wildlife	(132,455)	(14,717)	(0)	(1,932)	(147,172)	(1,932)	(100,415)	(100,415)	(0)	(4,227)	(200,830)	(4,227)
Natural Environment	(12,609)	(2,383,260)	(10)	(153)	(2,395,869)	(163)	(0)	(0)	(10)	(153)	(0)	(163)
Flood Control & Related Problems	1,073,207	673,904	3,805	14,719	1,747,081	18,524	552,453	679,339	6,994	31,481	1,231,792	38,475
Flood Control												
Principal Reaches	(530,348)	(33,454)	(3,253)	(761)	(563,802)	(4,014)	(336,291)	(42,236)	(5,384)	(1,042)	(378,527)	(6,426)
Upstream	(292,444)	(76,891)	(0)	(4,568)	(369,335)	(4,568)	(93,583)	(22,917)	(0)	(5,313)	(116,500)	(5,313)
Land Treatment	(38,237)	(483,860)	(0)	(0)	(522,097)	(0)	(42,074)	(531,383)	(0)	(0)	(573,457)	(0)
Sediment and Erosion												
Critical Land Treatment	(34,797)	(17,301)	(0)	(0)	(52,098)	(0)	(17,622)	(8,761)	(0)	(0)	(26,383)	(0)
Streambank	(42,043)	(300)	(552)	(1,503)	(42,313)	(2,055)	(41,797)	(179)	(1,610)	(2,403)	(41,976)	(4,013)
Roadbanks	(1,842)	(991)	(0)	(85)	(2,833)	(85)	(1,611)	(868)	(0)	(159)	(2,479)	(159)
Drainage												
Watershed Management	(1,479)	(28,102)	(0)	(5,916)	(29,581)	(5,916)	(3,634)	(69,034)	(0)	(20,450)	(72,668)	(20,450)
Channels	(132,017)	(33,005)	(0)	(1,886)	(165,022)	(1,886)	(15,841)	(3,961)	(0)	(2,114)	(19,802)	(2,114)
Water Quality and Pollution	195,685	81,402	0	3,379	277,087	3,379	572,642	194,541	0	4,079	767,183	4,079
Municipal Waste Treatment	(195,685)	(65,228)	(0)	(506)	(260,913)	(506)	(572,642)	(190,881)	0	(522)	(763,523)	(522)
Bacteria Control	(0)	(16,174)	(0)	(2,873)	(16,174)	(2,873)	(0)	(3,660)	(0)	(3,557)	(3,660)	(3,557)
Navigation	621,309	98,803	13,868	111	720,112	13,979	209,739	35,687	17,683	181	245,426	17,864
Hydropower	19,189	0	254	0	19,189	254	121,055	0	1,807	0	121,055	1,807
Coastal and Estuarine	3,900	1,900	0	36	5,800	36	10,500	10,500	0	166	21,000	166
Historical and Archeological	19,148	19,147	0	0	38,295	0	63,478	63,478	0	0	126,956	0
Health	0	0	0	5,402	0	5,402	0	0	0	9,336	0	9,336
TOTALS	3,130,842	4,078,466	72,702	97,554	7,209,278	170,256	2,489,326	1,694,688	136,003	193,059	4,184,014	329,062

Table 137 - Estimated Program Costs, Regional Summary, Regional Development Objective (Cont'd)

	2001-2020						Total Program Investment Cost ($1,000)		
	Investment		Annual O&M						
Feature	Federal	Non-Federal	Federal	Non-Federal	Investment	O&M	Federal	Non-Federal	Total
Water Supply	167,664	108,957	6,399	55,205	276,621	61,604	357,127	199,836	556,963
Municipal	(93,988)	(93,988)	(0)	(40,229)	(187,976)	(40,229)	(172,351)	(172,351)	(344,702)
Irrigation	(59,003)	(297)	(1,968)	(10,546)	(59,300)	(12,514)	(160,570)	(3,280)	(163,850)
Fish and Wildlife	(14,673)	(14,672)	(4,431)	(4,430)	(29,345)	(8,861)	(24,206)	(24,205)	(48,411)
Water Surface	443,831	443,831	1,724	13,786	887,662	15,510	1,194,226	796,489	1,990,715
Recreation									
Small Water	(442,901)	(442,901)	(0)	(11,464)	(885,802)	(11,464)	(766,290)	(766,288)	(1,532,578)
Large Water	(0)	(0)	(1,724)	(374)	(0)	(2,098)	(411,799)	(14,067)	(425,866)
Stream Access	(375)	(375)	(0)	(573)	(750)	(573)	(2,863)	(2,862)	(5,725)
Fish and Wildlife	(560)	(561)	(0)	(1,229)	(1,121)	(1,229)	(6,138)	(6,138)	(12,276)
Natural Environment	(0)	(0)	(0)	(146)	(0)	(146)	(7,141)	(7,140)	(14,281)
Lands	846,485	846,485	188,897	196,737	1,692,970	385,634	2,064,489	4,317,402	6,381,891
Recreation	(694,725)	(694,725)	(188,887)	(188,888)	(1,389,450)	(377,775)	(1,667,250)	(1,667,250)	(3,334,500)
Fish and Wildlife	(151,760)	(151,760)	(0)	(7,696)	(303,520)	(7,696)	(384,630)	(266,892)	(651,522)
Natural Environment	(0)	(0)	(10)	(153)	(0)	(163)	(12,609)	(2,383,260)	(2,395,869)
Flood Control & Related Problems	274,786	736,000	14,308	52,609	1,010,786	66,917	1,900,446	2,089,243	3,989,689
Flood Control									
Principal Reaches	(115,342)	(12,036)	(11,643)	(1,101)	(127,378)	(12,744)	(981,981)	(87,726)	(1,069,707)
Upstream	(55,215)	(13,347)	(0)	(5,770)	(68,562)	(5,770)	(441,242)	(113,155)	(554,397)
Land Treatment	(48,767)	(610,431)	(0)	(0)	(659,198)	(0)	(129,078)	(1,625,674)	(1,754,752)
Sediment and Erosion									
Critical Land Treatment	(6,839)	(3,407)	(0)	(0)	(10,246)	(0)	(59,258)	(29,469)	(88,727)
Streambank	(35,853)	(120)	(2,665)	(3,000)	(35,973)	(5,665)	(119,693)	(599)	(120,292)
Roadbanks	(1,150)	(619)	(0)	(212)	(1,769)	(212)	(4,603)	(2,478)	(7,081)
Drainage									
Watershed Management	(4,967)	(94,377)	(0)	(40,319)	(99,344)	(40,319)	(10,080)	(191,513)	(201,593)
Channels	(6,653)	(1,663)	(0)	(2,207)	(8,316)	(2,207)	(154,511)	(38,629)	(193,140)
Water Quality and Pollution	324,475	112,248	0	4,970	436,723	4,970	1,092,802	388,191	1,480,993
Municipal Waste Treatment	(324,475)	(108,158)	(0)	(622)	(432,633)	(622)	(1,092,802)	(364,267)	(1,457,069)
Bacteria Control	(0)	(4,090)	(0)	(4,348)	(4,090)	(4,348)	(0)	(23,924)	(23,924)
Navigation	502,765	164,106	23,047	182	666,871	23,229	1,333,813	298,596	1,632,409
Hydropower	0	0	1,807	0	0	1,807	140,244	0	140,244
Coastal and Estuarine	120,000	120,000	0	1,716	240,000	1,716	134,400	132,400	266,800
Historical and Archeological	22,800	22,790	0	0	45,590	0	105,426	105,415	210,841
Health	0	0	0	11,723	0	11,723	0	0	0
TOTALS	2,702,806	2,554,417	236,182	336,928	5,257,223	573,110	8,322,973	8,327,572	16,650,545

ENVIRONMENTAL QUALITY PROGRAM

Resource Use

General

Because Program A economic forecasts were adopted for the Environmental Quality objective, the National Income and Environmental Quality Programs are quite similar in content. They differ in only three significant respects: (1) land allocation, (2) flood control, and (3) water quality control. All other component plans are identical, as are the measures which make up those plans. Accordingly, only the land, flood control, and water quality plans are presented and discussed in the following narrative, after which the total Environmental Quality Program is displayed in tabular form (table 142).

Land Allocation

The land plan for this program is aimed at satisfying on a first priority basis recognized needs for preserving the environmental quality of significant natural land forms, water bodies, and forests. Accordingly, the plan (table 138) seeks the primary use of some 12.4 million acres for environmental quality purposes. Included are 756,000 acres scattered throughout the region in near-wilderness areas, rare ecological, botanical, and geological systems and lake shores. These are designated for exclusive use to maintain their environmental character. They cannot be used for any purpose other than fish and wildlife habitat.

Nearly 75 percent of the designated exclusive-use lands are located in WRPA 9 in the Atchafalaya River Basin below Krotz Springs, Louisiana. This area is now nationally significant because of its value as a bottom-land hardwood forest, a wetland area, a wilderness area, and a haven for fish and wildlife. Sixteen percent of the exclusive-use environmental acreage is situated in bottom-land hardwood forests in the Lower Arkansas and the Lower White River Basins of WRPA 2. The rest are located within small tracts of open land and forests in the other WRPA's. Lands reserved exclusively for satisfaction of environmental needs are listed by WRPA in table 139.

Aside from the designated exclusive items, the plan seeks to preserve the environmental quality of 11.6 million acres while allowing, under controlled conditions, multiple use for timber production, pasturage, recreation, and fish and wildlife. This restriction detracts somewhat from the land's ability to provide maximum returns for some secondary uses, but no attempt was made to measure these effects.

Some 7.3 million acres of the region's environmentally significant land areas are already considered to be in firm supply; i.e., not likely to change status over the next 50 years. Preservation of the remaining

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 1				
Open Land	312.0	312.0	312.0	312.0
Environmental Quality	-	-	-	-
Transportation, Urban and Built-up	-	-	-	-
Food and Fiber				
Cropland	(188.0)	(188.0)	(188.0)	(188.0)
Pastured Cropland	(30.0)	(30.0)	(30.0)	(30.0)
Permanent Pasture	(32.0)	(32.0)	(32.0)	(32.0)
Other	(62.0)	(62.0)	(62.0)	(62.0)
Commercial Fisheries	-	-	-	-
Minerals	-	-	-	-
Recreation				
Class A	-	-	-	-
Class B	-	-	-	-
Fish and Wildlife				
(Cropland)	-	-	-	-
(Pastureland)	-	-	-	-
(Wetlands)	-	-	-	-
Forest Land	879.0	879.0	879.0	879.0
Environmental Quality				
Botanical Systems	-	-	-	-
Bottomland Hardwoods1/	(879.0)	(879.0)	(879.0)	(879.0)
Lake Shores2/	-	(6.0)	(6.0)	(6.0)
Ecological Systems	-	-	-	-
Geological Systems	-	-	-	-
Scenic River Banks	-	-	-	-
Wetlands	-	-	-	-
Wilderness Areas	-	-	-	-
Food and Fiber				
Forest Products, et al.	(879.0)	(879.0)	(879.0)	(879.0)
Animal Roughage (Pasture)3/	(135.0)	(135.0)	(135.0)	(368.0)
Recreation				
Class B	-	-	-	-
Class C	-	-	-	-
Fish and Wildlife4/	(131.1)	(131.1)	(131.1)	(131.1)
Land Covered by Water				
Large Water Areas	368.0	368.0	368.0	368.0
Small Water Areas	-	-	-	-
Total Area, WRPA 1	1,559.0	1,559.0	1,559.0	1,559.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 2				
Open Land	7,879.0	8,653.0	8,639.0	8,600.0
Environmental Quality				
Open and Green Space[5/]	(6.1)	(8.0)	(8.0)	(8.0)
Ecological Systems[6/]	-	(1.0)	(1.0)	(1.0)
Geological Systems[7/]	-	(157.0)	(157.0)	(157.0)
Transportation, Urban and Built-up	(367.0)	(378.0)	(396.0)	(459.0)
Food and Fiber				
Cropland	(6,192.0)	(7,097.0)	(7,222.0)	(7,199.0)
Pastured Cropland	(380.0)	(494.0)	(478.0)	(478.0)
Permanent Pasture	(693.0)	(309.0)	(302.0)	(302.0)
Other	(247.0	(374.0)	(240.0)	(161.0)
Commercial Fisheries[8/]	(16.0)	(21.0)	(30.0)	(40.0)
Minerals[8/]	(26.0)	(35.0)	(56.0)	(87.0)
Recreation				
Class A[9/]	(6.1)	(7.1)	(8.4)	(12.1)
Class B[8/]	(7.1)	(7.5)	(7.5)	(10.4)
Fish and Wildlife				
(Cropland)[10/]	-	(288.0)	(319.0)	(375.0)
(Pastureland)[11/]	-	(123.0)	(137.0)	(161.0)
(Wetlands)[8/]	-	(101.0)	(101.0)	(101.0)
Forest Land	2,634.0	1,827.0	1,827.0	1,827.0
Environmental Quality				
Bottomland Hardwoods[1/]	(1,128.0)	(1,128.0)	(1,128.0)	(1,128.0)
Lake Shores[2/]	-	(1.0)	(1.0)	(1.0)
Scenic River Banks[2/]	-	(18.0)	(18.0)	(18.0)
Wilderness Areas[2/]	-	(24.0)	(24.0)	(24.0)
Ecological Systems[6/]	-	(120.0)	(120.0)	(120.0)
Geological Systems[1/]	-	(350.0)	(350.0)	(350.0)
Food and Fiber				
Forest Products, et al.	(2,634.0)	(1,707.0)	(1,707.0)	(1,707.0)
Animal Roughage (Pasture)[3/]	(365.0)	(447.0)	(454.0)	(775.0)
Recreation				
Class B[3/]	(7.0)	(7.6)	(7.6)	(10.4)
Class C[3/]	(0.6)	(0.6)	(0.7)	(0.9)
Fish and Wildlife[4/]	(280.5)	(381.0)	(444.6)	(535.3)
Land Covered by Water	189.0	222.0	236.0	275.0
Large Water Areas	(91.0)	(124.0)	(138.0)	(177.0)
Small Water Areas	(98.0)	(98.0)	(98.0)	(98.0)
Total Area, WRPA 2	10,702.0	10,702.0	10,702.0	10,702.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 3				
Open Land	4,436.0	4,505.0	4,840.0	4,650.0
Environmental Quality 5/	(2.9)	(34.0)	(34.0)	(34.0)
Transportation, Urban and Built-up	(355.0)	(401.0)	(536.0)	(724.0)
Food and Fiber				
Cropland	(2,206.0)	(2,094.0)	(2,162.0)	(2,003.0)
Pastured Cropland	(746.0)	(1,117.0)	(1,215.0)	(1,123.0)
Permanent Pasture	(929.0)	(501.0)	(549.0)	(498.0)
Other	(200.0)	(392.0)	(378.0)	(302.0)
Commercial Fisheries 8/	(0.6)	(1.0)	(2.0)	(3.0)
Minerals 8/	(2.0)	(4.0)	(9.0)	(14.0)
Recreation				
Class A 9/	(2.9)	(13.8)	(23.5)	(39.0)
Class B 8/	(2.4)	(11.9)	(20.2)	(33.6)
Fish and Wildlife				
(Cropland) 10/	-	(652.0)	(890.0)	(1,214.0)
(Pastureland) 11/	-	(279.0)	(380.0)	(520.0)
(Wetlands) 8/	-	(41.0)	(41.0)	(41.0)
Forest Land	2,310.0	2,056.0	1,515.0	1,515.0
Environmental Quality				
Bottomland Hardwoods 1/	(796.0)	(796.0)	(796.0)	(796.0)
Lake Shores 6/	-	(1.0)	(1.0)	(1.0)
Scenic River Banks 2/	-	(28.0)	(28.0)	(28.0)
Wetlands 2/	-	(64.0)	(64.0)	(64.0)
Food and Fiber				
Forest Products, et al.	(2,310.0)	(2,055.0)	(1,514.0)	(1,514.0)
Animal Roughage (Pasture) 3/	(297.0)	(464.0)	(921.0)	(551.0)
Recreation				
Class B 3/	(2.3)	(11.9)	(20.3)	(33.6)
Class C 3/	(0.2)	(1.2)	(1.9)	(3.0)
Fish and Wildlife 4/	(186.3)	(228.1)	(266.2)	(320.5)
Land Covered by Water	72.0	257.0	463.0	653.0
Large Water Areas	(40.0)	(225.0)	(431.0)	(621.0)
Small Water Areas	(32.0)	(32.0)	(32.0)	(32.0)
Total Area, WRPA 3	6,818.0	6,818.0	6,818.0	6,818.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 4				
Open Land	5,118.0	5,878.0	5,809.0	5,769.0
Environmental Quality5/	(0.8)	(8.0)	(8.0)	(8.0)
Transportation, Urban and Built-up	(328.0)	(335.0)	(361.0)	(426.0)
Food and Fiber				
Cropland	(3,314.0)	(3,172.0)	(3,206.0)	(3,109.0)
Pastured Cropland	(326.0)	(517.0)	(518.0)	(530.0)
Permanent Pasture	(243.0)	(1,628.0)	(1,552.0)	(1,590.0)
Other	(207.0)	(226.0)	(172.0)	(114.0)
Commercial Fisheries8/	(11.3)	(20.0)	(37.0)	(54.0)
Minerals8/	(3.0)	(3.0)	(4.0)	(5.0)
Recreation				
Class A9/	(0.8)	(3.8)	(5.4)	(8.0)
Class B8/	(1.0)	(3.1)	(4.4)	(6.5)
Fish and Wildlife				
(Cropland)10/	-	(292.0)	(327.0)	(391.0)
(Pastureland)11/	-	(125.0)	(140.0)	(167.0)
(Wetlands)8/	-	(97.0)	(97.0)	(97.0)
Forest Land	3,222.0	2,434.0	2,434.0	2,434.0
Environmental Quality				
Bottomland Hardwoods1/	(1,148.0)	(1,148.0)	(1,148.0)	(1,148.0)
Lake Shores2/	-	(2.0)	(2.0)	(2.0)
Wilderness Areas6/	-	(5.0)	(5.0)	(5.0)
Ecological Systems6/	-	(10.0)	(10.0)	(10.0)
Geological Systems1/	-	(1.0)	(1.0)	(1.0)
Food and Fiber				
Forest Products, et al.	(3,222.0)	(2,419.0)	(2,419.0)	(2,419.0)
Animal Roughage (Pasture)2/	(587.0)	(1,073.0)	(875.0)	(800.0)
Recreation				
Class B3/	(0.9)	(3.1)	(4.4)	(6.5)
Class C3/	(26.0)	(26.0)	(32.1)	(45.5)
Fish and Wildlife4/	(165.4)	(257.6)	(300.6)	(361.9)
Land Covered by Water	207.0	235.0	304.0	344.0
Large Water Areas	(74.0)	(102.0)	(171.0)	(211.0)
Small Water Areas	(133.0)	(133.0)	(133.0)	(133.0)
Total Area, WRPA 4	8,547.0	8,547.0	8,547.0	8,547.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 5				
Open Land	2,585.0	3,157.0	4,911.0	6,754.0
Environmental Quality5/	(2.6)	(13.0)	(13.0)	(13.0)
Transportation, Urban and Built-up	(440.0)	(458.0)	(532.0)	(647.0)
Food and Fiber				
Cropland	(732.0)	(970.0)	(2,404.0)	(3,504.0)
Pastured Cropland	(239.0)	(591.0)	(653.0)	(930.0)
Permanent Pasture	(982.0)	(919.0)	(1,065.0)	(1,358.0)
Other	(192.0)	(219.0)	(257.0)	(315.0)
Commercial Fisheries8/	(3.6)	(6.0)	(12.0)	(18.0)
Minerals8/	(8.0)	(9.0)	(9.0)	(10.0)
Recreation				
Class A9/	(2.6)	(6.1)	(9.1)	(13.5)
Class B8/	(2.3)	(5.2)	(7.7)	(11.5)
Fish and Wildlife				
(Cropland)10/	-	(394.0)	(467.0)	(572.0)
(Pastureland)11/	-	(169.0)	(200.0)	(245.0)
Forest Land	10,228.0	9,598.0	7,818.0	5,903.0
Environmental Quality				
Bottomland Hardwoods1/	(2,362.0)	(2,362.0)	(2,362.0)	(2,362.0)
Lake Shores2/	-	(1.0)	(1.0)	(1.0)
Ecological Systems6/	-	(20.0)	(20.0)	(20.0)
Scenic River Banks2/	-	(28.0)	(28.0)	(28.0)
Geological Systems1/	-	(22.0)	(22.0)	(22.0)
Wilderness Areas6/	-	(10.0)	(10.0)	(10.0)
Food and Fiber				
Forest Products, et al.	(10,228.0)	(9,567.0)	(7,787.0)	(5,872.0)
Animal Roughage (Pasture)3/	(947.0)	(1,048.0)	(1,090.0)	(1,515.0)
Recreation				
Class B3/	(2.2)	(5.3)	(7.5)	(11.6)
Class C3/	(23.8)	(23.8)	(31.5)	(46.9)
Fish and Wildlife				
Management Areas, etc.4/	(258.4)	(361.9)	(422.3)	(508.5)
Wetlands3/	-	(531.0)	(723.0)	(791.0)
Land Covered by Water	251.0	309.0	335.0	(407.0)
Large Water Areas	(175.0)	(233.0)	(259.0)	(331.0)
Small Water Areas	(76.0)	(76.0)	(76.0)	(76.0)
Total Area, WRPA 5	13,064.0	13,064.0	13,064.0	13,064.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 6				
Open Land	2,630.0	2,698.0	2,696.0	2,686.0
Environmental Quality				
Open and Green Space 5/	(0.5)	(2.0)	(2.0)	(2.0)
Unique Geological and Botanical Systems 12/	-	(1.0)	(1.0)	(1.0)
Transportation, Urban and Built-up	(78.0)	(79.0)	(79.0)	(80.0)
Food and Fiber				
Cropland	(1,908.0)	(1,951.0)	(1,958.0)	(1,970.0)
Pastured Cropland	(118.0)	(174.0)	(171.0)	(164.0)
Permanent Pasture	(494.0)	(410.0)	(403.0)	(385.0)
Other	(32.0)	(83.0)	(84.0)	(86.0)
Commercial Fisheries 8/	(1.4)	(4.0)	(9.0)	(14.0)
Minerals 8/	(2.0)	(2.0)	(3.0)	(4.0)
Recreation				
Class A 9/	(0.5)	(1.7)	(2.2)	(2.9)
Class B 8/	(0.4)	(1.5)	(1.9)	(2.5)
Fish and Wildlife				
(Cropland) 10/	-	(83.0)	(83.0)	(91.0)
(Pastureland) 11/	-	(35.0)	(36.0)	(39.0)
Forest Land	831.0	763.0	763.0	763.0
Environmental Quality				
Bottomland Hardwoods 1/	(756.0)	(756.0)	(756.0)	(756.0)
Food and Fiber	-			
Forest Products, et al.	(831.0)	(763.0)	(763.0)	(763.0)
Animal Roughage (Pasture) 3/	(117.0)	(224.0)	(234.0)	(415.0)
Recreation				
Class B 3/	(0.3)	(1.5)	(1.9)	(2.6)
Class C 3/	(0.0)	(0.2)	(0.2)	(0.2)
Fish and Wildlife				
Management Areas, etc. 4/	(45.2)	(70.2)	(81.9)	(98.6)
Wetlands 2/	-	(85.0)	(85.0)	(85.0)
Land Covered by Water	72.0	72.0	74.0	84.0
Large Water Areas	(32.0)	(32.0)	(34.0)	(44.0)
Small Water Areas	(40.0)	(40.0)	(40.0)	(40.0)
Total Area, WRPA 6	3,533.0	3,533.0	3,533.0	3,533.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	1980	2000	2020
WRPA 7				
Open Land	1,604.0	2,371.0	2,269.0	2,269.0
Environmental Quality				
Open and Green Space5/	(0.4)	(1.0)	(1.0)	(1.0)
Geological Systems6/		(1.0)	(1.0)	(1.0)
Transportation, Urban and Built-up	(116.0)	(121.0)	(136.0)	(151.0)
Food and Fiber				
Cropland	(337.0)	(570.0)	(183.0)	(123.0)
Pastured Cropland	(180.0)	(376.0)	(443.0)	(465.0)
Permanent Pasture	(941.0)	(1,209.0)	(1,446.0)	(1,516.0)
Other	(30.0)	(95.0)	(61.0)	(14.0)
Commercial Fisheries8/	(0.9)	(1.0)	(3.0)	(4.0)
Minerals8/	(1.0)	(1.0)	(1.0)	(1.0)
Recreation				
Class A9/	(0.4)	(1.6)	(2.2)	(3.3)
Class B8/	(0.4)	(1.3)	(1.9)	(2.8)
Fish and Wildlife				
(Cropland)10/	-	(74.0)	(85.0)	(103.0)
(Pastureland)11/	-	(32.0)	(36.0)	(44.0)
Forest Land	2,509.0	1,687.0	1,686.0	1,686.0
Environmental Quality				
Bottomland Hardwoods1/	(500.0)	(500.0)	(500.0)	(500.0)
Lake Shores2/		(1.0)	(1.0)	(1.0)
Scenic River Banks2/		(13.0)	(13.0)	(13.0)
Ecological Systems6/		(3.0)	(3.0)	(3.0)
Wilderness Areas6/		(27.0)	(27.0)	(27.0)
Food and Fiber				
Forest Products, et al.	(2,509.0)	(1,654.0)	(1,653.0)	(1.653.0)
Animal Roughage(Pasture)3/	(694.0)	(1,251.0)	(895.0)	(580.0)
Recreation				
Class B3/	(0.3)	(1.4)	(2.0)	(2.9)
Class C3/	(0.1)	(0.1)	(0.2)	(0.3)
Fish and Wildlife				
Management Areas, etc.4/	(74.0)	(104.0)	(121.4)	(146.1)
Wetlands2/	-	(49.0)	(49.0)	(49.0)
Land Covered by Water	94.0	149.0	252.0	252.0
Large Water Areas	(38.0)	(93.0)	(196.0)	(196.0)
Small Water Areas	(56.0)	(56.0)	(56.0)	(56.0)
Total Area, WRPA 7	4,207.0	4,207.0	4,207.0	4,207.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 8				
Open Land	1,268.0	1,419.0	1,796.0	2,193.0
Environmental Quality				
Open and Green Space5/	(0.5)	(12.0)	(12.0)	(12.0)
Geological Systems	-	(1.0)	(1.0)	(1.0)
Transportation,				
Urban and Built-up	(182.0)	(206.0)	(260.0)	(333.0)
Food and Fiber				
Cropland	(329.0)	(217.0)	(218.0)	(286.0)
Pastured Cropland	(54.0)	(349.0)	(470.0)	(579.0)
Permanent Pasture	(655.0)	(587.0)	(788.0)	(963.0)
Other	(48.0)	(58.0)	(58.0)	(30.0)
Commercial Fisheries8/	(0.3)	(1.0)	(1.0)	(2.0)
Minerals8/	(4.0)	(5.0)	(6.0)	(8.0)
Recreation				
Class A9/	(0.5)	(6.0)	(9.6)	(15.3)
Class B10/	(0.9)	(5.2)	(8.3)	(13.1)
Fish and Wildlife				
(Cropland)10/	-	(217.0)	(170.0)	(193.0)
(Pastureland)11/	-	(122.0)	(156.0)	(262.0)
Forest Land	2,265.0	2,099.0	1,700.0	1,262.0
Environmental Quality				
Bottomland Hardwoods1/	(988.0)	(988.0)	(988.0)	(988.0)
Lake Shores2/	-	(1.0)	(1.0)	(1.0)
Scenic River Banks2/	-	(17.0)	(17.0)	(17.0)
Botanical Systems 6/	-	(2.0)	(2.0)	(2.0)
Geological Systems1/	—	(200.0)	(200.0)	(200.0)
Food and Fiber				
Forest Products, et al.	(2,265.0)	(2,098.0)	(1,699.0)	(1,261.0)
Animal Roughage (Pasture)3/	(650.0)	(615.0)	(1,183.0)	(1,213.0)
Recreation				
Class B3/	(0.8)	(5.2)	(8.3)	(13.2)
Class C3/	(0.0)	(0.5)	(0.8)	(1.2)
Fish and Wildlife				
Management Areas, etc.4/	(5.0)	(19.0)	(22.2)	(26.7)
Wetlands5/	-	(144.0)	(190.0)	(395.0)
Land Covered by Water	118.0	133.0	155.0	196.0
Large Water Areas	(73.0)	(88.0)	(110.0)	(151.0)
Small Water Areas	(45.0)	(45.0)	(45.0)	(45.0)
Total Area, WRPA 8	3,651.0	3,651.0	3,651.0	3,651.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 9				
Open Land	4,530.0	6,038.0	6,063.0	6,013.0
Environmental Quality				
Open and Green Space5/	(1.3)	(12.0)	(12.0)	(12.0)
Beaches and Shores12/	-	(16.0)	(16.0)	(16.0)
Botanical Systems12/	-	(500.0)	(500.0)	(500.0)
Geological Systems12/	-	(3.0)	(3.0)	(3.0)
Transportation, Urban and Built-up	(236.0)	(243.0)	(271.0)	(314.0)
Food and Fiber				
Cropland	(1,827.0)	(2,673.0)	(2,583.0)	(2,452.0)
Pastured Cropland	(749.0)	(1,316.0)	(1,361.0)	(1,379.0)
Permanent Pasture	(911.0)	(1,072.0)	(1,108.0)	(1,120.0)
Other	(807.0)	(734.0)	(740.0)	(748.0)
Commercial Fisheries8/	(10.7)	(14.0)	(20.0)	(26.0)
Minerals8/	(7.0)	(11.0)	(16.0)	(24.0)
Recreation				
Class A9/	(1.3)	(7.5)	(10.6)	(15.1)
Class B8/	(1.0)	(6.4)	(9.1)	(13.0)
Fish and Wildlife				
(Cropland)10/	-	(829.0)	(1,216.0)	(1,636.0)
(Pastureland)11/	-	(153.0)	(172.0)	(202.0)
(Wetlands)8/	-	(144.0)	(162.0)	(190.0)
Forest Land	3,442.0	1,932.0	1,871.0	1,871.0
Environmental Quality				
Bottomland Hardwoods1/	(1,324.0)	(1,324.0)	(1,324.0)	(1,324.0)
Geological Systems2/	-	(3.0)	(3.0)	(3.0)
Lake Shores2/	-	(3.0)	(3.0)	(3.0)
Scenic River Banks2/	-	(9.0)	(9.0)	(9.0)
Wetlands2/	-	(121.0)	(121.0)	(121.0)
Wilderness Areas6/	-	(555.0)	(555.0)	(555.0)
Food and Fiber				
Forest Products, et al.	(3,442.0)	(1,376.0)	(1,315.0)	(1,315.0)
Animal Roughage (Pasture)3/	(383.0)	(677.0)	(711.0)	(751.0)
Recreation				
Class B3/	(0.9)	(6.5)	(9.2)	(13.0)
Class C3/	(0.2)	(0.6)	(0.9)	(1.1)
Fish and Wildlife4/	(690.2)	(717.2)	(836.9)	(1,007.7)
Land Covered by Water	538.0	540.0	576.0	626.0
Large Water Areas	(400.0)	(402.0)	(438.0)	(488.0)
Small Water Areas	(138.0)	(138.0)	(138.0)	(138.0)
Total Area, WRPA 9	8,510.0	8,510.0	8,510.0	8,510.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 10				
Open Land	2,472.0	2,587.0	2,644.0	2,727.0
Environmental Quality				
Open and Green Space 5/	(1.3)	(31.0)	(31.0)	(31.0)
Beaches and Shores 12/	-	(160.0)	(160.0)	(160.0)
Transportation, Urban and Built-up	(230.0)	(260.0)	(327.0)	(419.0)
Food and Fiber				
Cropland	(310.0)	(271.0)	(250.0)	(241.0)
Pastured Cropland	(49.0)	(90.0)	(95.0)	(100.0)
Permanent Pasture	(202.0)	(295.0)	(308.0)	(322.0)
Other	(1,681.0)	(1,671.0)	(1,664.0)	(1,645.0)
Commercial Fisheries 8/	(1.2)	(2.0)	(3.0)	(3.0)
Minerals 8/	(14.0)	(17.0)	(23.0)	(30.0)
Recreation				
Class A 9/	(1.3)	(14.4)	(23.0)	(36.3)
Class B 8/	(0.9)	(12.4)	(19.8)	(31.2)
Fish and Wildlife				
(Cropland) 10/	-	(271.0)	(250.0)	(242.0)
(Pastureland) 11/	-	(291.0)	(372.0)	(424.0)
(Wetlands) 8/	-	(275.0)	(353.0)	(530.0)
Forest Land	1,317.0	1,202.0	1,142.0	1,052.0
Environmental Quality				
Bottomland Hardwoods 1/	(970.0)	(970.0)	(970.0)	(970.0)
Lake Shores 2/	-	(4.0)	(4.0)	(4.0)
Scenic River Banks 2/	-	(4.0)	(4.0)	(4.0)
Botanical Systems 6/	-	(1.0)	(1.0)	(1.0)
Food and Fiber				
Forest Products, et al.	(1,317.0)	(1,201.0)	(1,141.0)	(1,051.0)
Animal Roughage (Pasture) 3/	(32.0)	(59.0)	(62.0)	(65.0)
Recreation				
Class B 3/	(0.8)	(12.5)	(19.8)	(31.2)
Class C 3/	(0.0)	(1.2)	(1.8)	(2.7)
Fish and Wildlife 4/	(185.3)	(196.3)	(229.1)	(275.8)
Land Covered by Water	1,158.0	1,158.0	1,161.0	1,168.0
Large Water Areas	(939.0)	(939.0)	(942.0)	(949.0)
	(219.0)	(219.0)	(219.0)	(219.0)
Total Area, WRPA 10	4,947.0	4,947.0	4,947.0	4,947.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA's 1 through 10				
Open Land	32,834.0	37,618.0	39,979.0	41,973.0
Environmental Quality				
Open and Green Space[5]	(16.4)	(122.0)	(122.0)	(122.0)
Beaches and Shores[12]	-	(176.0)	(176.0)	(176.0)
Botanical Systems[13]	-	(501.0)	(501.0)	(501.0)
Ecological Systems[6]	-	(1.0)	(1.0)	(1.0)
Geological Systems[14]	-	(161.0)	(161.0)	(161.0)
Transportation, Urban and Built-up	(2,332.0)	(2,481.0)	(2,898.0)	(3,553.0)
Food and Fiber				
Cropland	(17,343.0)	(19,203.0)	(20,374.0)	(21,075.0)
Pastured Cropland	(2,871.0)	(5,054.0)	(5,434.0)	(5,778.0)
Permanent Pasture	(6,782.0)	(6,962.0)	(7,553.0)	(8,086.0)
Other	(3,506.0)	(3,914.0)	(3,716.0)	(3,477.0)
Commercial Fisheries[8]	(46.0)	(70.0)	(117.0)	(164.0)
Minerals[8]	(67.0)	(87.0)	(127.0)	(183.0)
Recreation				
Class A[9]	(16.4)	(62.0)	(94.0)	(145.5)
Class B[8]	(16.0)	(54.5)	(80.8)	(124.6)
Fish and Wildlife				
(Cropland)[10]	-	(3,100.0)	(3,870.0)	(4,817.0)
(Pastureland)[11]	-	(1,329.0)	(1,629.0)	(2,064.0)
(Wetlands)[8]	-	(658.0)	(754.0)	(959.0)
Forest Land	29,637.0	24,477.0	21,635.0	19,192.0
Environmental Quality				
Bottomland Hardwoods[1]	(10,852.0)	(10,852.0)	(10,852.0)	(10,852.0)
Ecological Systems[6]	-	(153.0)	(153.0)	(153.0)
Geological Systems[15]	-	(579.0)	(579.0)	(579.0)
Lake Shores[15]	-	(20.0)	(20.0)	(20.0)
Scenic River Banks[2]	-	(117.0)	(117.0)	(117.0)
Wetlands[2]	-	(185.0)	(185.0)	(185.0)
Wilderness Areas[1]	-	(644.0)	(644.0)	(644.0)
Food and Fiber				
Forest Products, et al.	(29,637.0)	(23,719.0)	(20,887.0)	(18,434.0)
Animal Roughage (Pasture)[3]	(4,207.0)	(5,993.0)	(6,560.0)	(7,033.0)
Recreation				
Class B[2]	(15.9)	(55.0)	(81.3)	(125.0)
Class C[3]	(50.9)	(54.2)	(70.1)	(101.8)
Fish and Wildlife				
Management Areas, etc.[4]	(2,021.4)	(2,466.4)	(2,856.2)	(3,418.2)
Wetlands[4]	-	(809.0)	(1,047.0)	(1,320.0)
Land Covered by Water	3,067.0	3,443.0	3,924.0	4,373.0
Large Water Areas	(2,230.0)	(2,606.0)	(3,08 .0)	(3,536.0)
Small Water Areas	(837.0)	(837.0)	(837.0)	(837.0)
Total Area, LMR	65,538.0	65,538.0	65,538.0	65,538.0

Table 138 - Land Use Plan, Environmental Quality Program, Lower Mississippi Region (cont'd)

1/ Primary use for environmental quality. Counted in forest products acreage.
2/ Primary use for environmental quality. Counted in bottom-land hardwoods.
3/ Multiple-use land. Counted in forest products acreage.
4/ Primary use for fish and wildlife. Counted in forest products acreage.
5/ Primary use for environmental quality, with multiple-use for Class A recreation land. Counted in transportation, urban and built-up acreages.
6/ Exclusive use for environmental quality purposes.
7/ Primary use for environmental quality. Counted in permanent pasture acreage as multiple-use.
8/ Multiple-use land. Counted in other open land acreage categories.
9/ Multiple-use with urban open and green space. Counted in transportation, urban and built-up acreage.
10/ Multiple-use land. Counted in cropland acreage.
11/ Multiple-use land. Counted in permanent pasture acreage.
12/ Primary use for environmental quality purposes. Counted in Other category.
13/ See WRPA's 8 and 9.
14/ See WRPA's 2, 8, and 9.
15/ See WRPA Summaries.

Table 139 - Lands Designated for Exclusive Use as Environmental Quality Components, Environmental Quality Program Lower Mississippi Region

WRPA	Feature	Land Area (1,000 Acres)	Existing Use	Environmental Quality Attribute(s)
1	None	-	-	-
2	White River Batture Lands	60.0 1/	Forest 2/	Ecological System
	Lower Arkansas Lands	40.0	Forest 2/	Ecological System
	Lower White River	10.0	Forest 2/	Wilderness Area
	Lower Arkansas River	10.0 1/	Forest 2/	Wilderness Area
	Grand Prairie	1.0	Pasture	Ecological System
	Subtotal	121.0		
3	Reelfoot Lake	0.4	Fish & Wildlife	Scenic Lake and Ecological System
	Murphy's Pond	0.1	Fish & Wildlife	Scenic Lake and Ecological System
	Open Lake	0.5	Fish & Wildlife	Scenic Lake and Ecological System
	Subtotal	1.0		
4	Sharkey Bayou	2.5	Forest 2/	Ecological System
	Mathews Brake	0.7	Forest 2/	Ecological System
	Dutch Brake	0.7	Forest 2/	Ecological System
	Blue Lake Brake	0.8	Forest 2/	Ecological System
	Ashland Brake	1.0	Forest 2/	Ecological System
	Beckham Brake	1.0	Forest 2/	Ecological System
	Gayden Brake	1.1	Forest 2/	Ecological System
	Eagle Brake	0.9	Forest 2/	Ecological System
	Alcorn Brake	0.8	Forest 2/	Ecological System
	McIntyre Lake Area	0.4	Forest 2/	Ecological System
	Delta National Forest	5.0	Forest	Wilderness Area
	Subtotal	14.9		
5	Seven Devils Swamp	20.0 1/	Forest 2/	Wilderness Area 3/
	Felsenthal Basin	5.0	Forest 2/	Wilderness Area
	Dismal Swamp	5.0	Forest 2/	Wilderness Area
	Subtotal	30.0		

Table 139 - Lands Designated for Exclusive Use as Environmental Quality Components, Environmental Quality Program, Lower Mississippi Region (cont'd)

WRPA	Feature	Land Area (1,000 Acres)	Existing Use	Environmental Quality Attribute(s)
6	None	-	-	-
7	Buffalo River Foster Lake Area	3.0	Forest 2/	Ecological System
	Buffalo River Foster Lake Area	7.0	Forest 2/	Wilderness Area
	Loess Bluff Hills near Vicksburg	1.0	Forest	Geological System
	Grand Gulf Area	10.0	Forest 2/	Wilderness Area
	Homochitto National Forest	10.0	Forest	Wilderness Area
	Subtotal	31.0		
8	Port Hudson	0.1	"Other"	Botanical System
	St. Helena Parish	0.1	Forest	Botanical System
	Clio-Livingston Parish	0.5	Forest 2/	Botanical System
	Spruce Pine Stands in Livingston and Tangipahoa Parishes	1.0	Forest	Botanical System
	Waterfalls	0.1	-	Geological System
	Bayou Sara	0.2	Pasture	Geological System
	The Plains	0.5	Pasture	Geological System
	Subtotal	2.5		
9	Atchafalaya Floodway	555.0 1/	Forest 2/	Wilderness 4/
10	Avondale	0.2	Forest	Botanical System
	Spruce Pine Stands in St. Tammany Parish	0.8	Forest	Botanical System
	Subtotal	1.0		
	Total	756.4		

1/ Includes lands expected to remain in their present status during 50-year study period. Such lands are counted in existing supply and no program measures or costs are required for their preservation.
2/ Bottom-land hardwood forests.
3/ Also classified as ecological system.
4/ Also classified as wetland area.

5.1 million acres will require positive short-term (1970-1980) measures to insure their continued availability for the enjoyment of future generations. Proposed measures range from purchase to land-use regulation, and are displayed in table 140 by WRPA. Measures required for recreation and fish and wildlife purposes are identical to those used in Program A, and to avoid duplication are not repeated here. Similarly, since environmental needs manifest themselves in the short-range time frame (1970-1980) and are identical throughout the study period, incremental measures beyond 1980 involve only operation and maintenance of previously instituted measures and are not repeated.

Water Quality

The Environmental Quality Program water quality plan calls for acvanced waste treatment for all 5-day BOD wastes in municipal and industrial waste discharges by 1980 and continued treatment at that level through the year 2020. It also stipulates that all point source 5-day BOD pollutants from the agricultural sector be assimilated by application of these wastes to productive cropland at a rate which can be fully utilized by crops, as in the National Income Program. All discharges containing harmful bacteria will be adequately chlorinated to eliminate the threat from pathogenic organisms. In spite of the high level of treatment specified, the plan calls upon the natural assimilative capacity of the region's streams to dilute a small amount of biodegradable wastes not handled by treatment. A minor amount of remaining waste load in critical stream reaches will also be handled by reaeration, but this option will be applied almost exclusively to industrial waste loads. The water quality plan is summarized in table 141.

Problem Amelioration

Flood Control

The Environmental Quality Program component for flood control is the same as that for the National Income Program except that structural solutions would receive special treatment. Such treatment would of necessity be determined during the course of more detailed studies of specific problems in order to resolve as many as possible of the conflicts between items of environmental significance and flood control which might surface. Such conflicts could not be precisely identified herein due to the study's scope, which precludes assembly of specific flood control measure locations and natural environmental component locations relative to each other. The type of add-ons to structural flood problem solutions which might be defined in more detailed studies are described generally as follows:

Reservoirs. Lakes created by the construction of dams for flood control and other purposes normally constitute positive and significant extrinsic values relative to the environmental quality of an area.

Table 140- Environmental Quality Program, Measures Used to Meet Land Area Needs, Lower Mississippi Region

WRPA	Item	Purpose and Amount: Exclusive Use (1,000 acres)	Purpose and Amount: Primary Use (1,000 acres)	Acreage in EQ Program (1,000 acres)	Selected Measure and Remarks
1	Bottom-land hardwoods		879	879	Easement on entire hardwood forest in WRPA 1 (6,000 acres are lake shores).
2	Open and green space		8	1	Purchase 900 acres and maintain as urban open and green space. Remainder is *multiple-use Class A recreation land.*
	Unique ecological system	1		1	Purchase 1,000 acres of virgin prairie in the Grand Prairie Region.
	Unique geological system		507	352	Purchase 157,000 acres of pasture land and 195,000 acres of forest land on Crowley's Ridge. Remaining 155,000 acres are in firm supply.
	Bottom-land hardwoods		1,008	917	Land-use regulation on 917,000 acres. Remainder is in firm supply.
	Unique ecological system	100		61	Land-use regulation on 60,000 acres in White River batture lands and 1,000 acres in Lower Arkansas River Basin. Remainder in firm supply.
	Wilderness areas	20		20	Land-use regulation on 10,000 acres in White River Basin and 10,000 acres in Arkansas Basin
3	Open and green space		34	29	Purchase 29,000 acres and maintain as urban open and green space. Remainder is multiple-use Class A recreation land and in scenic rivers and streams lands.
	Bottom-land hardwoods		795	666	Subsidy on 664,000; Purchase 2,000 acres; Remainder in firm supply.
	Lake shores	1		1	Purchase and reforest 400 acres; Purchase 100 acres; and subsidize 500 acres.
4	Open and green space		8	8	Purchase 8,000 acres and maintain as urban open and green space.
	Bottom-land hardwoods		1,133	201	Subsidize 186,100 acres; Purchase 9,900 acres, and apply land-use regulation to 5,000 acres.
	Unique ecosystems	10			Included above as purchased acreage.
	Wilderness area	5			Included above as lands secured by land-use regulation.
	Unique geological system		1	1	Purchase 1,055 acres of delta bluff hills.
5	Open and green space		13	13	Purchase 13,000 acres and maintain as urban open and green space.
	Bottom-land hardwoods		2,361	432	Subsidy on 431,300 acres and purchase 700 acres.
	Wilderness Area	10		10	Purchase 5,000 acres in Felsenthal Basin; 5,000 acres in Dismal Swamp.
	Ecological system - Wilderness area	20		20	5,000 acres purchased above, 15,000 acres in firm supply.
6	Open and green space		2	2	Purchase 2,000 acres and maintain as urban open and green space.
	Bottom-land hardwoods		756	147	Purchase 38,700 acres; Subsidize 108,300.
7	Open and green space		1	1	Purchase 1,000 acres and maintain as urban open and green space.
	Bottom-land hardwoods	20	479	92	Purchase 20,000 acres as wilderness areas, Subsidize 72,000 acres.
	Unique geological system	1		1	Purchase 1,000 acres of Loess bluffs near Vicksburg.
	Wilderness area	10		10	Secure 10,000 acres of Homochito National Forest as Wilderness Area by land-use regulation.
8	Open and green space		12	11	Purchase 11,000 acres and maintain as urban open and green space. Remainder is multiple-use Class A recreation land.
	Unique botanical system	2		2	Purchase 100 acres in East Baton Rouge Parish and subsidize 1,600 acres in Helena, Livingston, and Tangipahoa Parishes
	Unique geological system	1	200	201	Purchase 750 acres in various locations; Land-use regulation on 200,000 acres.
	Bottom-land hardwoods		988	188	Subsidy.
9	Open and green space		12	11	Purchase 11,000 acres and maintain as urban open and green space. Remainder is *multiple-use Class A recreation land.*
	Bottom-land hardwoods	213	1,324	244	Easement on 244,000 acres to insure the integrity of the 966,000 acre Atchafalaya Floodway as a wilderness area, wetlands, and unique botanical system.
	Unique geological system		306	213	Subsidize 213,000 acres to maintain system. Remainder in firm supply.
10	Open and green space		31	30	Purchase 30,000 acres and maintain as urban open and green space. Remainder is multiple-use Class A recreation land.
	Bottom-land hardwoods		970	190	Subsidize 190,000 acres. Remainder is in firm supply.
	Beaches and shores		160	119	Subsidize 119,000 acres to control 1,052 miles of shoreline. Remaining 354 miles of shoreline (41,000 acres) are in firm supply.
	Unique botanical system	1		1	Purchase 1,000 acres.
	LMR totals	415	11,989	5,075	

Table 141 - Water Quality Plan, Environmental Quality Program, Lower Mississippi Region

WRPA	Time Frame	Municipal: Gross BOD_5 Loading (1,000 lbs.)	Municipal: BOD_5 Removal (1,000 lbs.) Existing Treatment 1/	Municipal: BOD_5 Removal (1,000 lbs.) Proposed Treatment 2/	Municipal: BOD_5 Removal (1,000 lbs.) Stream Assimilation 3/	Municipal: BOD_5 Removal (1,000 lbs.) Mechanical Reaeration	Municipal: Remaining BOD_5 Load (1,000 lbs.)	Industrial: Gross BOD_5 Loading (1,000 lbs.)	Industrial: Existing Treatment 1/	Industrial: Proposed Treatment 4/	Industrial: Stream Assimilation 3/	Industrial: Mechanical Reaeration	Industrial: Remaining BOD_5 Load (1,000 lbs.)
2	1980	62	43	18	1	0	0	45	21	24	0	0	0
	2000	82	43	37	1	1	0	78	21	55	1	1	0
	2020	114	43	69	1	0	0	151	21	128	1	1	0
3	1980	193	34	155	4	0	0	490	192	281	13	4	0
	2000	288	34	249	5	0	0	969	192	760	13	4	0
	2020	403	34	362	7	0	0	1,991	192	1,765	26	8	0
4	1980	53	23	29	1	0	0	112	51	56	4	1	0
	2000	71	23	47	1	0	0	194	51	139	3	1	0
	2020	97	23	72	2	0	0	382	51	323	7	1	0
5	1980	79	46	31	2	0	0	1,046	456	567	22	1	0
	2000	108	46	60	2	0	0	1,867	456	1,391	19	1	0
	2020	146	46	98	2	0	0	3,643	456	3,148	37	2	0
6	1980	16	8	8	0	0	0	179	92	81	0	6	0
	2000	18	8	10	0	0	0	291	92	194	0	5	0
	2020	21	8	13	0	0	0	549	92	447	0	10	0
7	1980	10	4	6	0	0	0	226	99	118	9	0	0
	2000	13	4	9	0	0	0	397	99	290	8	0	0
	2020	18	4	14	0	0	0	765	99	651	15	0	0
8	1980	58	23	35	0	0	0	508	197	294	17	0	0
	2000	84	23	59	2	0	0	948	197	735	16	0	0
	2020	115	23	90	2	0	0	1,947	197	1,718	32	0	0
9	1980	90	40	50	0	0	0	506	223	269	7	7	0
	2000	115	40	73	2	0	0	827	223	593	2	9	0
	2020	144	40	101	3	0	0	1,483	223	1,239	9	12	0
10	1980	222	92	126	4	0	0	736	289	428	17	2	0
	2000	302	92	204	6	0	0	1,325	289	1,019	14	3	0
	2020	397	92	297	8	0	0	2,540	289	2,219	29	3	0
LMR	1980	783	313	458	12	0	0	3,848	1,620	2,118	89	21	0
	2000	1,081	313	748	19	1	0	6,896	1,620	5,176	76	24	0
	2020	1,455	313	1,116	25	1	0	13,451	1,620	11,638	196	37	0

(Column groups as printed: "Municipal and Industrial Organic Wastes" spans both "Municipal" and "Industrial".)

1/ Treatment level as of 1970.
2/ Conventional advanced treatment to achieve 98 percent BOD_5 removal by 1980, with continued 98 percent removal through 2020.
3/ Assimilative capacity of receiving streams at point sources of effluent discharges.
4/ Conventional secondary treatment to achieve 96 percent BOD_5 removal (equivalent to 90 percent for municipalities) by 1980, and advance treatment to achieve 98 percent removal by 2000, with continued 98 percent removal through 2020.

Table 141 - Water Quality Plan, Environmental Quality Program, Lower Mississippi Region (Cont'd)

WRPA	Time Frame	Agricultural Organic Wastes: Gross BOD_5 Wastes5/ (1,000 lbs.)	Land Assimilation (1,000 lb.): Existing6/	Land Assimilation (1,000 lb.): Future7/	Potential Discharge To Streams8/ (1,000 lbs.)	Proposed Treatment9/ (1,000 lbs.)	Remaining BOD_5 Discharge (1,000 lbs.)	Inorganic Wastes: Bacteriological Wastes: Bacterial Effluent Discharge (mgd)	Bacteria Control (mgd): Existing Chlorination10/	Bacteria Control (mgd): Proposed Chlorination	Unchlorinated Discharge (mgd)	Other Pollutants
2	1980	711	553	130	28	28	0	43.4	3.5	39.9	0	11/
	2000	950	553	360	37	37	0	60.0	3.5	56.5	0	11/
	2020	1,263	553	662	48	48	0	86.3	3.5	82.8	0	11/
3	1980	1,004	785	175	44	44	0	141.1	27.3	113.8	0	11/
	2000	1,336	785	493	58	58	0	216.8	27.3	189.5	0	11/
	2020	1,774	785	914	75	75	0	308.2	27.3	280.9	0	11/
4	1980	1,123	863	221	39	39	0	49.6	4.0	45.6	0	11/
	2000	1,478	863	568	47	47	0	67.4	4.0	63.4	0	11/
	2020	1,968	863	1,042	63	63	0	92.8	4.0	88.8	0	11/
5	1980	1,367	1,009	292	66	66	0	43.8	19.0	24.8	0	11/
	2000	1,857	1,009	759	89	89	0	58.1	19.0	39.1	0	11/
	2020	2,481	1,009	1,353	119	119	0	83.0	19.0	64.0	0	11/
6	1980	462	362	90	11	11	0	6.7	4.6	2.1	0	11/
	2000	619	361	244	14	14	0	7.9	4.6	3.3	0	11/
	2020	828	361	449	18	18	0	9.6	4.6	5.0	0	11/
7	1980	580	443	114	23	23	0	8.0	1.9	6.1	0	11/
	2000	779	443	305	31	31	0	10.8	1.9	8.9	0	11/
	2020	1,037	443	554	40	40	0	15.2	1.9	13.3	0	11/
8	1980	622	500	98	24	24	0	45.6	25.2	20.4	0	11/
	2000	825	500	293	32	32	0	69.5	25.2	44.3	0	11/
	2020	1,087	500	546	41	41	0	101.5	25.2	76.3	0	11/
9	1980	834	659	149	26	26	0	76.9	44.5	32.4	0	11/
	2000	1,112	659	420	33	33	0	106.1	44.5	61.6	0	11/
	2020	1,478	659	777	42	42	0	143.5	44.5	99.0	0	11/
10	1980	112	88	21	3	3	0	208.8	134.7	74.1	0	11/
	2000	150	88	58	4	4	0	272.7	134.7	138.0	0	11/
	2020	200	88	107	5	5	0	350.0	134.7	215.3	0	11/
LMR	1980	6,815	5,261	1,290	264	264	0	623.9	264.7	359.2	0	11/
	2000	9,106	5,261	3,500	345	345	0	869.3	264.7	604.6	0	11/
	2020	12,116	5,261	6,404	451	451	0	1,190.1	264.7	925.4	0	11/

5/ Organic wastes from livestock and poultry including both point sources and non-point sources.
6/ Organic waste disposal as of 1970 by such methods as direct land application, aerated lagoon-irrigation systems, holding tanks, or some combination of these.
7/ Expected increase in assimilation on land areas in addition to 1970 disposal by this method.
8/ Waste discharges entering surface waters as equivalent point sources of pollution.
9/ Treatment consisting of the application of solid wastes to productive cropland at a rate which will provide nutrients that can be fully utilized by the crops.
10/ Treatment level as of 1970.
11/ Treatment of inorganic sediments included in sediment and erosion plan. Treatment of other pollutants (thermal wastes, heavy metals, nutrients, toxics, odor, color, phenolics, pH, oil and grease, dissolved solids, etc.) unspecified due to a lack of data.

Where unique intrinsic environmental values would be destroyed by reservoir construction, the relative worth of the values - environmental and otherwise - would somehow have to be weighed and one or the other possibly foregone.

Channel Alterations. This type of flood control measure is particularly applicable to flood problems in the flat alluvial valley and is, in many cases, the most practicable solution to flood problems. On the other hand, it is probably the most odious solution to environmentalists. As in the case of reservoirs, the relative values of both the problem amelioration measures and affected environmental quality components would have to be considered before any decision is reached. Special treatment of channel alterations to mitigate adverse effects on the natural environment might include one or more of the following:

1. Channels could be excavated along irregular alignment where allowable and appropriate.

2. Channel excavation could be limited to one side only, and could be alternated from bank to bank through fairly short reaches. This would allow some woodlands to remain along flood control channels, providing shade for the altered stream and preserving some of its scenic quality.

3. In cleared areas excavated materials could be appropriately placed and planted with suitable cover to achieve desired effects. However, the entire stretch of both banks would not be vegetated due to the need for maintenance areas.

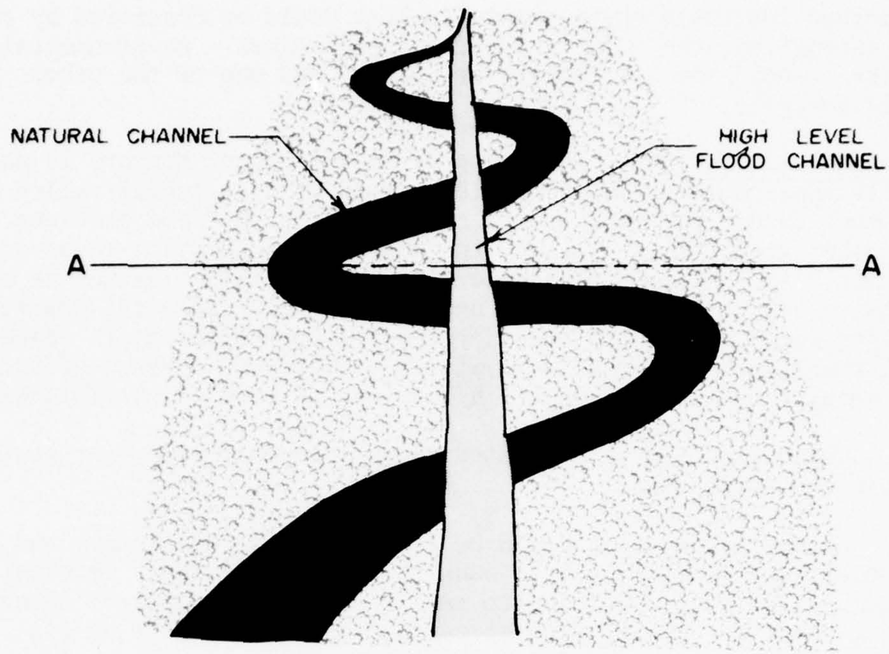
4. On streams with little normal flow or where low flow would be reduced to an intolerable level by channels, low water weirs could be constructed to regulate water levels.

5. Leveed floodways could be constructed in lieu of channel improvement where feasible and acceptable.

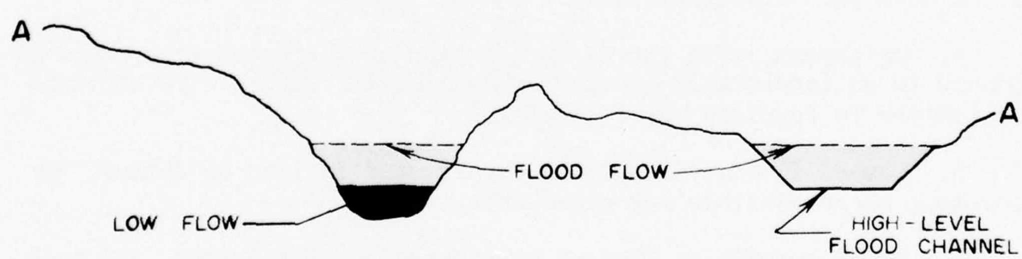
6. Where cutoffs or channel straightening is required, and soil conditions and design velocities permit, high-level flood channels could be constructed, allowing the old channel to carry low flows and to continue to carry a portion of flood flows, as shown in figure 18.

Levees. The decision to build levees when construction would interfere with a natural environmental quality component would be made as described for reservoirs and channels. Clearing would be limited and trees or other vegetation reestablished as appropriate.

Pumping Plants. Pumping stations could be architecturally designed to blend with surroundings.



PLAN



PROFILE

LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

SPECIAL TREATMENT OF CHANNEL ALTERATION
ENVIRONMENTAL QUALITY PROGRAM

FIGURE 18

It must be recognized, however, that special treatment of structural solutions to flood problems would cause a major increase in the costs of the flood control program.

Since the basic flood control plan is the same for the Environmental Quality Program as the National Income Program, the tabular data are not repeated. The reader is referred to tables 106 through 110 in the National Income Program summary.

Summary of Environmental Quality Program

A composite of the plans that collectively make up the Environmental Quality Program is given in table 142. Coastal and estuarine, archeological and historical, and health aspects plans are included.

Program Costs

Estimated costs for the Environmental Quality Program are summarized in table 143. Estimates are expressed in terms of January 1972 dollars, without adjustment or discounting by time periods. The allocation of costs between Federal and non-Federal interests is in accordance with the percentages used for the National Income Program (see table 122, page 331). Certain flood control features of the ongoing Mississippi River and Tributaries Project are included in the costs, as in the case of the National Income Program.

The total investment cost of the Environmental Quality Program is estimated at $15.3 billion, of which $7.5 billion is Federal cost and $7.8 billion is non-Federal. Average annual operation and maintenance costs are estimated at $331 million.

Table 142 - Environmental Quality Program Composition, Lower Mississippi Region

Planning Area & Time Frame	Water Supply (mgd)			Water Surface Area			Land (1,000 Acres)			
	Municipal	Fish & Wildlife	Total	Recreation (1,000 Acres)	Fish & Wildlife (Miles)[1]	Natural Environment (1,000 Acres)	Recreation[4]	Fish & Wildlife	Natural Environment	Total
WRPA 1										
1970-1980	0.0	0.0	0.0	0.0	[3]	4.0	0.0	0.0	879.0	6.0
1980-2000	0.0	0.0	0.0	0.0	[3]	0.0	0.0	0.0	0.0	0.0
2000-2020	0.0	0.0	0.0	0.0	[3]	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	[3]	4.0	0.0	0.0	879.0	6.0
WRPA 2										
1970-1980	5.3	50.0	186.5[2]	0.0	1203.0	15.0	1.5	104.0	1352.0	297.4
1980-2000	16.5	110.0	153.3[2]	3.0	0.0	0.0	0.4	63.6	0.0	65.0
2000-2020	26.0	110.0	136.0[2]	45.0	0.0	0.0	9.6	90.7	0.0	100.3
Total	47.8	270.0	475.8[2]	48.0	1203.0	15.0	11.1	258.3	1352.0	297.4
WRPA 3										
1970-1980	33.9	43.0	76.9	139.0	822.0	7.0	20.1	56.2	696.0[5]	139.9
1980-2000	102.4	86.0	188.4	185.0	0.0	0.0	17.4	38.1	0.0	66.2
2000-2020	130.7	86.0	216.7	173.0	0.0	0.0	32.8	54.3	0.0	97.6
Total	267.0	215.0	482.0	497.0	822.0	7.0	78.3	148.6	696.0	303.7
WRPA 4										
1970-1980	11.9	22.0	33.9	8.0	1100.0	3.0	4.3	92.2	210.0	112.9
1980-2000	24.1	30.0	54.1	67.0	0.0	0.0	8.7	43.0	0.0	52.8
2000-2020	33.9	34.0	67.9	38.0	0.0	0.0	17.6	61.3	0.0	81.5
Total	69.9	86.0	155.9	113.0	1100.0	3.0	30.6	196.5	210.0	247.2
WRPA 5										
1970-1980	11.6	31.0	42.6	0.0	1931.0	4.0	6.0	103.5	475.0[5]	145.0
1980-2000	23.9	60.0	83.9	0.0	0.0	0.0	12.4	66.4	0.0	76.1
2000-2020	44.0	62.0	106.0	60.0	0.0	0.0	23.3	80.2	0.0	113.6
Total	79.5	153.0	232.5	60.0	1931.0	4.0	41.7	250.1	475.0	334.7
WRPA 6										
1970-1980	1.0	8.0	9.0	0.0	536.0	1.0	2.3	25.0	149.0[5]	31.6
1980-2000	2.3	16.0	18.3	2.0	0.0	0.0	1.0	11.7	0.0	13.0
2000-2020	3.3	17.0	20.3	10.0	0.0	0.0	2.0	16.7	0.0	18.7
Total	6.6	41.0	47.6	12.0	536.0	1.0	5.3	53.4	149.0	63.3
WRPA 7										
1970-1980	3.3	2.0	5.3	0.0	450.0	4.0	2.6	30.0	104.0	58.1
1980-2000	6.8	6.0	12.8	0.0	0.0	0.0	1.9	17.4	0.0	19.3
2000-2020	10.7	5.0	15.7	0.0	0.0	0.0	3.0	24.7	0.0	27.7
Total	20.8	13.0	33.8	0.0	450.0	4.0	7.4	72.1	104.0	105.1
WRPA 8										
1970-1980	16.9	2.0	18.9	0.0	400.0	2.0	9.2	14.0	402.0[5]	48.4
1980-2000	36.5	3.0	39.5	0.0	0.0	0.0	6.5	3.2	0.0	13.3
2000-2020	48.9	4.0	52.9	36.0	0.0	0.0	11.4	4.5	0.0	20.3
Total	102.3	9.0	111.3	36.0	400.0	2.0	29.1	21.7	402.0	82.0
WRPA 9										
1970-1980	20.0	73.0	93.0	0.0	928.0	1.0	11.4	27.0	468.0[5]	61.9
1980-2000	34.2	188.0	424.2[2]	0.0	0.0	0.0	5.7	119.7	0.0	128.5
2000-2020	41.5	120.0	425.5[2]	0.0	0.0	0.0	11.0	170.8	0.0	183.2
Total	95.7	381.0	942.7[2]	0.0	928.0	1.0	28.1	317.5	468.0	373.6
WRPA 10										
1970-1980	35.6	0.0	35.6	0.0	329.0	0.0	24.4	11.0	340.0[5]	72.5
1980-2000	89.8	2.0	91.8	0.0	0.0	0.0	15.3	32.8	0.0	56.7
2000-2020	118.1	1.0	119.1	0.0	0.0	0.0	29.0	46.7	0.0	83.7
Total	243.5	3.0	247.0	0.0	329.0	0.0	68.7	90.5	340.0	212.9
Region										
1970-1980	139.5	231.0	501.7[2]	147.0	7699.0	41.0	81.8	463.9	5075.0	809.4
1980-2000	336.5	501.0	1066.3[2]	257.0	0.0	0.0	69.3	389.9	0.0	490.9
2000-2020	457.1	439.0	1160.1[2]	362.0	0.0	0.0	141.2	561.9	0.0	732.6
Total	933.1	1171.0	2728.1[2]	766.0	7699.0	41.0	292.3	1415.7	5075.0	2032.9

1/ Stream miles.
2/ Includes irrigation withdrawals.
3/ The main stem of the Mississippi River is not considered quality stream fishing in the fish and wildlife context involved here. However, access is provided (though no mileage is given) and costs are included in the program (shared equally by recreation) for this access which will make the Mississippi River available to residents of adjoining WRPA's for limited fishing and recreation activities.
4/ Overlaps Natural Environmental Quality acreage in some WRPA's. Double counting has been eliminated in cost tables.
5/ Provides all or part of Class A recreation lands for 2000 and 2020.

Table 142 - Environmental Quality Program Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Flood Control									
	Principal Reaches					Upstream Watersheds				
			Reservoirs				Retarding Dams			
	Levees (Miles)	Channels (Miles)	Number	Storage (1000 Acre-Ft.)	Pumping Plants (Number)	Channels (Miles)	Number	Storage (1000 Acre-Ft.)	Floodplain Management (1000 Acres)	Watershed Management (1000 Acres)
WRPA 1										
1970-1980	0	0	0	0	0	0	0	0	0	0
1980-2000	0	0	0	0	0	0	0	0	0	0
2000-2020	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
WRPA 2										
1970-1980	5.9	641.6	0	0	5	4,878	268	149	2,236	8,034
1980-2000	9.7	618.0	0	0	3	130	0	0	87	291
2000-2020	0	340.0	0	0	0	95	5	11	92	411
Total	15.6	1599.6	0	0	8	5,103	273	160	2,415	8,736
WRPA 3										
1970-1980	7.7	292.0	1	18	7	660	201	244	293	1,929
1980-2000	169.2	51.7	0	0	2	454	120	134	111	918
2000-2020	0	96.9	0	0	0	269	92	99	115	668
Total	176.9	440.6	1	18	9	1,383	413	477	519	3,515
WRPA 4										
1970-1980	359.4	928.3	0	0	1	3,674	53	42	1,370	4,737
1980-2000	76.6	208.1	0	0	9	18	16	18	24	131
2000-2020	82.5	605.0	0	0	9	1,146	12	11	305	970
Total	518.5	1741.4	0	0	19	4,838	81	71	1,699	5,838
WRPA 5										
1970-1980	152.9	69.0	11	450	3	389	116	209	664	1,730
1980-2000	118.7	242.9	1	80	6	146	2	15	87	162
2000-2020	2.0	62.0	0	0	1	301	50	101	504	1,283
Total	343.6	373.9	12	530	10	836	168	325	1,255	3,175
WRPA 6										
1970-1980	0	266.7	0	0	1	2,026	0	0	1,465	1,876
1980-2000	1.5	159.6	0	0	1	325	0	0	111	317
2000-2020	0	105.0	0	0	0	0	0	0	0	0
Total	1.5	531.3	0	0	2	2,351	0	0	1,576	2,193
WRPA 7										
1970-1980	12.4	12.0	0	0	1	1,157	284	423	348	2,690
1980-2000	7.0	0	0	0	2	163	94	142	60	1,018
2000-2020	6.0	0	0	0	0	0	0	0	0	0
Total	25.4	12.0	0	0	3	1,320	378	565	408	3,708
WRPA 8										
1970-1980	0	6.0	0	0	0	983	55	104	734	1,505
1980-2000	0	3.0	0	0	0	368	98	169	219	1,225
2000-2020	10.5	3.0	0	0	2	0	12	37	17	443
Total	10.5	12.0	0	0	2	1,351	165	310	970	3,173
WRPA 9										
1970-1980	13.5	163.0	0	0	0	2,875	0	0	1,810	3,025
1980-2000	13.9	0	0	0	0	511	0	0	469	797
2000-2020	62.0	0	0	0	0	0	0	0	0	0
Total	89.4	163.0	0	0	0	3,386	0	0	2,279	3,822
WRPA 10										
1970-1980	20.0	0	0	0	5	505	0	0	337	669
1980-2000	61.6	0	0	0	17	344	3	13	335	530
2000-2020	44.0	0	0	0	3	40	0	0	42	42
Total	125.6	0	0	0	25	889	3	13	714	1,241
Region										
1970-1980	571.8	2378.6	12	468	22	17,147	977	1,171	9,258	26,196
1980-2000	528.2	1283.3	1	80	40	2,459	333	491	1,502	5,389
2000-2020	207.0	1211.9	0	0	15	1,851	171	259	1,074	3,819
Total	1307.0	4873.8	13	548	77	21,457	1,481	1,921	11,834	35,404

Table 142 - Environmental Quality Program Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Land Treatment[6/] (1000 Acres)	Sediment and Erosion Control			Drainage		Municipal Water Quality Control			
		Streambanks (Miles)	Roadbanks (Miles)	Total (Miles)	Watershed Management (1000 Acres)	Channels (Miles)	Secondary Treatment (1000 lb. BOD_5)	Advance Treatment (1000 lb. BOD_5)	Other[7/] (1000 lb. BOD_5)	Bacteria Control[8/] (mgd)
WRPA 1										
1970-1980	0	0	0	0	0	0	0	0	0	0
1980-2000	0	0	0	0	0	0	0	0	0	0
2000-2020	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
WRPA 2										
1970-1980	3256.5	128	441	569	474.3	4930.0	18.0	0	1.0	39.9
1980-2000	3597.6	49	386	435	948.4	5080.0	0	37.0	2.0	16.6
2000-2020	4023.7	36	275	311	948.5	5120.0	0	69.0	2.0	26.3
Total	10,877.8	213	1102	1315	2371.2	15,130.0	-	-	-	82.8
WRPA 3										
1970-1980	2512.3	369	554	923	16.1	140.0	155.0	0	4.0	113.8
1980-2000	2613.5	222	485	707	32.2	240.0	0	249.0	5.0	75.7
2000-2020	2726.8	152	346	498	32.3	230.0	0	362.0	7.0	91.4
Total	7852.6	743	1385	2128	80.6	610.0	-	-	-	280.9
WRPA 4										
1970-1980	3354.1	266	806	1072	294.9	4040.0	29.0	0	1.0	45.6
1980-2000	3697.5	191	705	896	589.8	3130.0	0	47.0	1.0	17.8
2000-2020	3838.5	143	503	646	589.8	3100.0	0	72.0	2.0	25.4
Total	10,890.1	600	2014	2614	1474.5	10,270.0	-	-	-	88.8
WRPA 5										
1970-1980	3385.8	76	1174	1250	114.6	910.0	51.0	0	2.0	24.8
1980-2000	3612.0	50	1028	1078	229.1	1310.0	0	60.0	2.0	14.3
2000-2020	4073.3	35	734	769	229.1	1370.0	0	98.0	2.0	24.9
Total	11,071.1	161	2936	3097	572.8	3590.0	-	-	-	64.0
WRPA 6										
1970-1980	1259.3	42	165	207	131.7	1460.0	8.0	0	0.0	2.1
1980-2000	1410.2	37	145	182	263.4	1560.0	0	10.0	0.0	1.2
2000-2020	1530.2	28	103	131	263.4	1350.0	0	15.0	0.0	1.7
Total	4199.7	107	413	520	658.5	4370.0	-	-	-	5.0
WRPA 7										
1970-1980	1261.9	106	524	630	21.4	410.0	6.0	0	0.0	6.1
1980-2000	1236.1	67	458	525	42.8	250.0	0	9.0	0.0	2.8
2000-2020	1406.4	44	327	371	42.8	230.0	0	14.0	0.0	4.4
Total	3904.4	217	1309	1526	107.0	890.0	-	-	-	13.3
WRPA 8										
1970-1980	851.9	40	232	272	20.8	540.0	35.0	0	0.0	20.4
1980-2000	798.7	24	203	227	41.6	390.0	0	59.0	2.0	23.9
2000-2020	871.5	16	145	161	41.6	230.0	0	90.0	3.0	32.0
Total	2522.1	80	580	660	104.0	1160.0	-	-	-	76.3
WRPA 9										
1970-1980	1857.9	8	599	1079	196.8	2210.0	50.0	0	0.0	32.4
1980-2000	2091.5	3	524	811	393.5	2240.0	0	73.0	2.0	29.2
2000-2020	2213.6	4	374	566	393.6	2000.0	0	101.0	3.0	37.4
Total	6163.0	15	1497	2456	983.9	6450.0	-	-	-	99.0
WRPA 10										
1970-1980	670.0	2	38	40	25.8	430.0	126.0	0	4.0	74.1
1980-2000	631.1	1	33	34	51.7	420.0	0	204.0	6.0	63.9
2000-2020	544.0	1	23	24	51.6	290.0	0	297.0	9.0	77.3
Total	1845.1	4	94	98	129.1	1140.0	-	-	-	215.3
Region										
1970-1980	18,409.7	1,037	4533	6042	1296.4	15,070.0	458.0	0	12.0	359.2
1980-2000	19,688.2	644	2967	4895	2592.5	14,620.0	0	748.0	20.0	245.4
2000-2020	21,228.0	459	2830	3477	2592.7	13,920.0	0	1116.0	26.0	320.8
Total	59,325.9	2,140	11,330	14,414	6481.6	43,610.0	-	-	-	925.4

6/ Includes land treatment to reduce flood runoff and critical area treatment to reduce sediment and erosion.
7/ Includes mechanical reaeration and stream assimilation.
8/ Chlorination.

Table 142 - Environmental Quality Program Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Navigation Facilities: Channels (Miles): Deep Draft	Shallow Draft	Total	Harbors (Number)	Locks (Number)	Hydropower Production (MW)	Coastal & Estuarine	Archeological & Historical	Public Health
WRPA 1									
1970-1980	288.0	0	288.0	0	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	288.0	0	288.0	0	0	0	0	9/	10/
WRPA 2									
1970-1980	0	200.0	200.0	2	0	7.5	0	9/	10/
1980-2000	0	0	0	6	0	70.6	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	200.0	200.0	9	0	78.1	0	9/	10/
WRPA 3									
1970-1980	0	0	0	1	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	2	0	0	0	9/	10/
WRPA 4									
1970-1980	9	0	0	7	1	18.0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	10	1	18.0	0	9/	10/
WRPA 5									
1970-1980	0	0	0	5	2	40.0	0	9/	10/
1980-2000	0	0	0	2	0	50.0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	9	2	90.0	0	9/	10/
WRPA 6									
1970-1980	0	0	0	3	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	0	0	4	0	0	0	9/	10/
WRPA 7									
1970-1980	0	0	0	0	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	1	0	0	0	9/	10/
WRPA 8									
1970-1980	0	0	0	0	0	0	11/	9/	10/
1980-2000	0	0	0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	1	0	11/	9/	10/
Total	0	0	0	0	3	0	11/	9/	10/
WRPA 9									
1970-1980	6.5	84.0	90.5	0	2	0	11/	9/	10/
1980-2000	34.0	270.0	304.0	0	2	0	11/	9/	10/
2000-2020	200.0	0	200.0	0	0	0	11/	9/	10/
Total	240.5	354.0	594.5	0	4	0	11/	9/	10/
WRPA 10									
1970-1980	50.0	97.0	147.0	0	1	0	11/	9/	10/
1980-2000	0	188.0	188.0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	3	0	11/	9/	10/
Total	50.0	285.0	335.0	0	6	0	11/	9/	10/
Region									
1970-1980	344.5	381.0	725.5	18	6	65.5	11/	9/	10/
1980-2000	34.0	458.0	492.0	11	6	120.6	11/	9/	10/
2000-2020	200.0	0	200.0	6	4	0	11/	9/	10/
Total	578.5	839.0	1417.5	35	16	186.1	11/	9/	10/

9/ Composed of surveying, testing and excavating archeological sites, and preservation, restoration and maintenance of historic resources. See Recommended Program Composition (table 154).

10/ Composed of public drinking water programs and vector abatement districts at state level. See Recommended Program Composition (table 154).

11/ Composed of measures for salinity control, shoreline erosion control, and water level management. See Recommended Program Composition (table 154).

Table 143 - Estimated Program Costs, Regional Summary, Environmental Quality Objective (All costs in $1,000)

Feature	1971-1980 Investment Federal	1971-1980 Investment Non-Federal	1971-1980 Annual O&M Federal	1971-1980 Annual O&M Non-Federal	1971-1980 Totals Investment	1971-1980 Totals O&M	1980-2000 Investment Federal	1980-2000 Investment Non-Federal	1980-2000 Annual O&M Federal	1980-2000 Annual O&M Non-Federal	1980-2000 Totals Investment	1980-2000 Totals O&M
Water Supply	19,834	19,832	620	11,955	39,666	12,575	126,626	54,204	3,512	25,854	180,830	29,366
Municipal	(16,577)	(16,576)	(0)	(11,336)	(33,153)	(11,336)	(44,707)	(44,707)	(0)	(20,706)	(89,414)	(20,706)
Irrigation	(0)	(0)	(0)	(0)	(0)	(0)	(75,286)	(2,864)	(1,968)	(3,604)	(78,150)	(5,572)
Fish and Wildlife	(3,257)	(3,256)	(620)	(619)	(6,513)	(1,239)	(6,633)	(6,633)	(1,544)	(1,544)	(13,266)	(3,088)
Water Surface	385,849	168,215	0	4,779	554,064	4,779	326,614	148,012	0	8,110	474,626	8,110
Recreation												
Small Water	(139,884)	(139,883)	(0)	(2,082)	(279,767)	(2,082)	(147,093)	(147,093)	(0)	(4,216)	(294,186)	(4,216)
Large Water	(231,699)	(14,067)	(0)	(1,084)	(245,766)	(1,084)	(178,600)	(0)	(0)	(2,098)	(178,600)	(2,098)
Stream Access	(2,075)	(2,075)	(0)	(457)	(4,150)	(415)	(413)	(412)	(0)	(538)	(825)	(538)
Fish and Wildlife	(5,050)	(5,050)	(0)	(1,010)	(10,100)	(1,010)	(508)	(507)	(0)	(1,112)	(1,015)	(1,112)
Natural Environment	(7,141)	(7,140)	(0)	(146)	(14,281)	(146)	(0)	(0)	(0)	(146)	(0)	(146)
Lands	769,493	3,375,747	46,883	51,392	4,145,240	98,275	361,008	361,007	85,528	91,597	722,015	177,125
Recreation	(463,800)	(463,800)	(46,743)	(46,742)	(927,600)	(93,485)	(292,775)	(292,775)	(85,388)	(85,387)	(585,550)	(170,775)
Fish and Wildlife	(132,455)	(14,717)	(0)	(1,932)	(147,172)	(1,932)	(68,233)	(68,232)	(0)	(3,492)	(136,465)	(3,492)
Natural Environment	(173,238)	(2,897,230)	(140)	(2,718)	(3,070,468)	(2,858)	(0)	(0)	(140)	(2,718)	(0)	(2,858)
Flood Control & Related Problems	1,049,108	597,224	3,805	12,583	1,646,332	16,388	520,270	590,602	6,763	26,016	1,110,872	32,779
Flood Control												
Principal Reaches	(530,348)	(33,454)	(3,253)	(620)	(563,802)	(3,873)	(313,214)	(42,044)	(5,153)	(900)	(355,258)	(6,053)
Upstream	(292,444)	(76,891)	(0)	(4,568)	(369,335)	(4,568)	(93,583)	(22,917)	(0)	(5,313)	(116,500)	(5,313)
Land Treatment	(31,890)	(419,794)	(0)	(0)	(451,684)	(0)	(36,354)	(459,100)	(0)	(0)	(495,454)	(0)
Sediment and Erosion												
Critical Land Treatment	(34,797)	(17,301)	(0)	(0)	(52,098)	(0)	(17,622)	(8,761)	(0)	(0)	(26,383)	(0)
Streambank	(42,043)	(300)	(552)	(1,503)	(42,343)	(2,055)	(41,797)	(179)	(1,610)	(2,403)	(41,976)	(4,013)
Roadbanks	(1,842)	(991)	(0)	(85)	(2,833)	(85)	(1,611)	(868)	(0)	(159)	(2,479)	(159)
Drainage												
Watershed Management	(1,043)	(19,818)	(0)	(4,173)	(20,861)	(4,173)	(2,811)	(53,413)	(0)	(15,417)	(56,224)	(15,417)
Channels	(114,701)	(28,675)	(0)	(1,634)	(143,376)	(1,634)	(13,278)	(3,320)	(0)	(1,824)	(16,598)	(1,824)
Water Quality and Pollution	381,506	142,793	(0)	3,144	524,299	3,144	243,149	83,849	0	3,734	326,998	3,734
Municipal Waste Treatment	(381,506)	(127,168)	(0)	(386)	(508,674)	(386)	(243,149)	(81,050)	(0)	(462)	(324,199)	(462)
Bacteria Control	(0)	(15,625)	(0)	(2,758)	(15,625)	(2,758)	(0)	(2,799)	(0)	(3,272)	(2,799)	(3,272)
Navigation	614,529	98,461	13,698	111	712,990	13,809	147,879	32,437	17,313	181	180,316	17,494
Hydropower	19,189	0	254	0	19,189	254	121,055	0	1,807	0	121,055	1,807
Coastal and Estuarine	3,900	1,900	0	36	5,800	36	10,500	10,500	0	166	21,000	166
Historical and Archeological	19,148	19,147	0	0	38,295	0	63,478	63,478	0	0	126,956	0
Health	0	0	0	5,402	0	5,402	0	0	0	9,336	0	9,336
TOTALS	3,262,556	4,423,319	65,260	89,402	7,685,875	154,662	1,920,579	1,344,089	114,923	164,994	3,264,668	279,917

Table 143 - Estimated Program Costs, Regional Summary, Environmental Quality Objective (All costs in $1,000) (Cont'd)

Feature	2001-2020 Investment Federal	2001-2020 Investment Non-Federal	2001-2020 Annual O&M Federal	2001-2020 Annual O&M Non-Federal	2001-2020 Totals Investment	2001-2020 Totals O&M	Total Program Investment Cost ($1,000) Federal	Total Program Investment Cost ($1,000) Non-Federal	Total Program Investment Cost ($1,000) Total
Water Supply	112,205	86,071	4,201	41,455	198,276	45,656	258,665	160,107	418,772
Municipal	(76,324)	(76,325)	(0)	(33,480)	(152,649)	(33,480)	(137,608)	(13,608)	(275,216)
Irrigation	(26,268)	(132)	(1,968)	(5,743)	(26,400)	(7,711)	(101,554)	(2,996)	(104,550)
Fish and Wildlife	(9,613)	(9,614)	(2,233)	(2,232)	(19,227)	(4,465)	(19,503)	(19,503)	(39,006)
Water Surface	253,941	253,941	0	12,122	507,882	12,122	966,404	570,169	1,536,573
Recreation									
Small Water	(253,021)	(253,021)	(0)	(8,044)	(506,042)	(8,044)	(539,998)	(539,997)	(1,079,995)
Large Water	(0)	(0)	(0)	(2,098)	(0)	(2,098)	(410,299)	(14,067)	(424,366)
Stream Access	(375)	(375)	(0)	(613)	(750)	(613)	(2,863)	(2,862)	(5,725)
Fish and Wildlife	(545)	(545)	(0)	(1,221)	(1,090)	(1,221)	(6,103)	(6,102)	(12,205)
Natural Environment	(0)	(0)	(0)	(146)	(0)	(146)	(7,141)	(7,141)	(14,282)
Lands	653,157	653,158	154,280	162,574	1,306,315	316,854	1,783,658	4,389,912	6,173,570
Recreation	(555,875)	(555,875)	(154,140)	(154,140)	(1,111,750)	(308,280)	(1,312,450)	(1,312,450)	(2,624,900)
Fish and Wildlife	(97,282)	(97,283)	(0)	(5,716)	(194,565)	(5,716)	(297,970)	(180,232)	(478,202)
Natural Environment	(0)	(0)	(140)	(2,718	(0)	(2,858)	(173,238)	(2,897,230)	(3,070,468)
Flood Control & Related Problems	288,539	607,815	8,921	43,020	896,354	51,941	1,857,917	1,759,041	3,653,558
Flood Control									
Principal Reaches	(137,839)	(12,128)	(6,256)	(960)	(149,967)	(7,216)	(981,401)	(87,626)	(1,069,027)
Upstream	(55,215)	(13,347)	(0)	(5,770)	(68,562)	(5,770)	(441,242)	(113,155)	(554,397)
Land Treatment	(41,756)	(501,886)	(0)	(0)	(543,642)	(0)	(110,000)	(1,380,780)	(1,490,780)
Sediment and Erosion									
Critical Land Treatment	(6,839)	(3,407)	(0)	(0)	(10,246)	(0)	(59,258)	(29,469)	(88,727)
Streambank	(35,853)	(120)	(2,665)	(3,000)	(35,973)	(5,665)	(119,693)	(599)	(120,292)
Roadbanks	(1,150)	(619)	(0)	(212)	(1,769)	(212)	(4,603)	(2,478)	(7,081)
Drainage									
Watershed Management	(3,938)	(74,821)	(0)	(31,169)	(78,759)	(31,169)	(7,792)	(148,052)	(155,844)
Channels	(5,949)	(1,487)	(0)	(1,909)	(7,436)	(1,909)	(133,928)	(33,482)	(167,410)
Water Quality and Pollution	303,554	105,019	0	4,407	408,573	4,407	928,209	331,661	1,259,870
Municipal Waste Treatment	(303,554)	(101,185)	(0)	(562)	(404,739)	(562)	(928,209)	(309,403)	(1,237,612)
Bacteria Control	(0)	(3,834)	(0)	(3,845)	(3,834)	(3,845)	(0)	(22,258)	(22,258)
Navigation	564,625	167,360	22,877	182	731,985	23,059	1,327,032	298,258	1,625,290
Hydropower	0	0	1,807	0	0	1,807	140,244	0	140,244
Coastal and Estuarine	120,000	120,000	0	1,716	240,000	1,716	134,400	132,400	266,800
Historical and Archeological	22,800	22,790	0	0	45,590	0	105,426	105,415	210,841
Health	0	0	0	11,723	0	11,723	0	0	0
TOTALS	2,318,821	2,016,154	192,086	277,199	4,334,975	469,285	7,501,955	7,783,563	15,285,518

PROGRAM IMPACTS

General

The individual effectiveness of program components in meeting functional needs has been previously discussed in detail. This section provides an analysis of the interaction of component impacts, assuming certain recommended measures will be implemented in the future. The objective is to determine if adjustments in resource allocation for the recommended program are appropriate.

Water depletions through water withdrawals and consumptive use impact upon water quality. These impacts can be measured in terms of changes in the concentration of certain water quality parameters, such as total dissolved solids (TDS), but they cannot easily be translated into a reallocation of water. The impacts of land development are largely environmental, and therefore intuitive to a high degree. It is virtually impossible to resolve some land-use conflicts, as in the case of a single unit of land needed for both crops (food production and income for the farmer) and forests (wildlife habitat and hunting experience for those who make their livelihood elsewhere). Water quality measures produce aesthetic impacts but, again, these are largely untranslatable into adjustments in resource allocation. Implementation of plans for problem amelioration, such as flood control, drainage, and sediment and erosion, however, produce direct and measurable impacts.

Water Withdrawals

Water withdrawals can have a direct effect on the quality of the resource. This occurs when consumptive uses cause increased salt levels in return flows, or when noncomsumptive uses involve the addition of inorganic pollutants in the form of dissolved solids, or salts, to return flows. In either case, total dissolved solids in the receiving body of water are increased.

Unfortunately, a regular coordinated program of surface water sampling in the Lower Mississippi Region is only now in the process of implementation. Data for this study therefore consisted mostly of sporadic sampling by many State and Federal agencies during the last two decades. Nevertheless, some apparently valid generalizations regarding total dissolved solids (or, in some measure, an indication of non-BOD pollutants) can be made.

Table 144 is a compilation of data presented in Appendix L, Water Quality and Pollution. It gives fairly comprehensive coverage of both maximum and minimum concentrations of dissolved solids in the region's surface waters, although some values had to be estimated from another

Table 144 - Dissolved Solids at Selected Locations in Waters of the Lower Mississippi Region

Stream Sampling Station	Date Collection	Mean Discharge 1/ (cfs)	Dissolved Solids 2/ (mg/l)
WRPA 1			
Mississippi River at Hickman, Ky.	9-13-69 9-24-69	197,000 65,000	310 262
Mississippi River near Vicksburg, Mississippi	10-18-61 11-17-61	311,000 535,000	242 216
Mississippi River near St. Francisville, Louisiana	11-11/20-63 2-11/19-57	137,000	342 111
Mississippi River at Luling Ferry, Louisiana	12-21/31-65 3-21/31-64		344 126
Mississippi River at New Orleans, Louisiana	11-7/67 1-5-68		272 178
WRPA 2			
St. Francis River near Fredricktown, Missouri	2-4-63 3-11-63		155 86
St. Francis River at St. Francis, Arkansas	11-13-69 5-12-70	218 5,880	146 74
St. Francis River at Lake City, Arkansas	8-28-58 4-30-58	977 6,210	132 78
Right Hand Chute of Little River at Riverdale, Arkansas	5-11/20-59 1-26/31-59	1,029 5,167	288 81
Left Hand Chute of Little River at Lepanto, Arkansas	10-27-65	301	311
St. Francis River Floodway near Marked Tree, Arkansas	4-29-58 8-20-58	8,720 2,520	156 101
St. Francis River at Marked Tree, Arkansas	12-18-69 6-19-70	219 2,660	275 92
St. Francis River at Parkin, Arkansas	8-27-58 5-7-58	1,880 9,390	227 59
St. Francis River near Riverfront, Arkansas	8-27-58 5-7-58	1,790 15,600	136 88
White River at De Valls Bluff, Arkansas	10-30-69 5-01-70	8,020 66,900	159 94
Arkansas River at Little Rock Arkansas 3/	11-28/29-53 3-3-57	8,600 29,200	2,400 105
Arkansas River at Lock and Dam No. 6 below Little Rock, Arkansas	9-09-70 4-20-70	10,100 135,000	403 476
Arkansas River at Dam No. 2	9-15-70 3-24-70		E342 E151
Bayou Meto near Stuttgart, Arksas	6-24-70 3-24-70	25 1,250	E98 E40
WRPA 3			
Mayfield Cr. at Lovelaceville, Kentucky	9-12-61 8-3-61	16 21	77 60
South Fork of the Forked Deer River at Jackson, Tennessee	12-17-64 6-11-68	738 136	74 36
North Fork of the Forked Deer River at Trenton, Tennessee	3-10-65 10-14-64	48.6	60 29
Hatchie River at Boliver, Tennessee	6-11-68	425	76
Hatchie River Mile 100.1 (Bolivar)	6-7-62 10-18-62	1,620 391	290 88
Hatchie River Mile 109.3	6-6-62 10-16-62		372 52
Wolf River at Rossville, Tennessee	4-27-67 12-10-65	3,010 185	79 30
Wolf River at Raleigh, Tennessee	7-19-64	272	25
WRPA 4			
Yazoo River at Greenwood, Mississippi	9-29-66 4-12-65	171 18,600	87 53
Sunflower River at Sunflower, Mississippi	6-28-67 1-6-67	144 1,160	172 101
Yazoo River at Redwood, Mississippi	11-1-61 5-22-62		174 43
WRPA 5			
Ouachita River at Monroe, Louisiana	10-16/18-54 5-21/31-58	3,870 90,600	2,860 55
Bayou DeLoutre on Dirt Road Just South of Arkansas	10-25-56 11-22-56		8,420 2,970
Bayou DeLoutre near Laran, Louisiana	6-21-58 5-20-58	27 1,150	2,300 66
Bayou DeLoutre at Deloutre, Louisiana	6-4-68		193
Bayou DeLoutre near Sterlington, Louisiana	6-4-68		138
Bayou D'Arbonne at Homer, Louisiana	11-26-63 2-27-64		80 35
Bayou D'Arbonne near Dubach, Louisiana	11-18-53 5-14-54	0.04 3,400	2,370 46
Bayou D'Arbonne near Farmersville, Louisiana	6-29-60 12-21-59		330 78

Table 144 - Dissolved Solids at Selected Locations in Waters of the Lower Mississippi Region (cont'd)

Stream Sampling Station	Date Collection	Mean Discharge 1/ (cfs)	Dissolved Solids 2/ (mg/1)
WRPA 5 (Cont'd)			
Bayou D'Arbonne near Monroe, Louisiana	6-4-48		66
Little River near Rochelle, Louisiana	11-2-65 4-18-68	222 9,420	18,300 58
Little River near Pollock, Louisiana	8-25-64 3-25-64		12,600 37
Red River near Hosston, Louisiana	8-15/20-64 4-26/30-64	3,940 73,100	1,130 117
Red River at Alexandria,	10-11/20-56 7-1/9-53	1,660 96,570	1,130 91
WRPA 6			
Boeuf River near Ark.-La. State Line	11-21-67 11-19-57	35 13,100	454 48
Bayou Macon on State Hwy.2 near Oak Grove, Louisiana	10-25-56 11-23-56		225 175
Boeuf River near Girard, Louisiana	11-15-57 4-6-57	72 1,290	628 43
Tensas River at Tendal, Louisiana	11-21-67 3-5-57	8.8 342	469 58
Bayou Macon near Kilbourne, Louisiana	12-6-67 5-22-58	29 4,220	323 56
Bayou Macon near Delhi, Louisiana	9-8-54 5-23-53	56.4 3,420	348 59
Tensas River at Clayton, Louisiana	9-3-68 5-23-68		236 82
WRPA 7			
Big Black River at Pickins, Mississippi	5-18-65 8-24-65	173 281	68 51
Big Black River near Port Gibson Mississippi	10-19-61 8-29-62		256 142
Homochitto River at Rosetta, Mississippi	4-4-67 6-6-67	367 371	62 38
WRPA 8			
Tangipahoa River at Tangipahoa, Louisiana	11-28-67	290	39
Tangipahoa River at Robert, Louisiana	3-1-68 7-17-68	824 317	36 36
Tangipahoa River near Ponchatoula Louisiana	1-21/31-64 4-25/5-2-64	1,170 5,910	56 23
Amite River near Darlington, Louisiana	6-22-68 2-28-68	270 352	38 31
Amite River at Magnolia, Louisiana	11-9-66		33

Stream Sampling Station	Date Collection	Mean Discharge 1/ (cfs)	Dissolved Solids 2/ (mg/1)
WRPA 8 (Cont'd)			
Amite River near Denham Springs, Louisiana	6-4-68 2-27-68	587 636	50 36
Amite River near Port Vincent, Louisiana	3-31-65 9-24-68		371 49
Amite River at S.H. 22 near Maurepas, Louisiana	11-14-67		305
Amite River Diversion Channel near St. Paul, Louisiana	11-14-67		166
WRPA 9			
Calcasieu River near Hineston, Louisiana	9-17-68	44	37
Calcasieu River near Glenmora, Louisiana	5-1-68 6-1-60	1170 39	21
Calcasieu River Oakdale Bridge, Louisiana	Minimum 58-65 Maximum 58-65		E22 E186
Calcasieu River near Oberlin, Louisiana	10-30-67 1-29-68	309 1470	155 28
Calcasieu River near Kinder, Louisiana	10-30-67 9-9-68 Minimum 58-65 Maximum 58-65	931 1160	37 73 E29 E291
Calcasieu River near Lake Charles, Louisiana	4-21/30-49		E19
Calcasieu River Moss Bluff (now at US 171 Bridge) Louidians	Minimum 58-65 Maximum 58-65		E25 E4539
Mermentau River at Mermentau, Louisiana	6-16-53		E52
Mermentau River at US 90, L Louisiana	Minimum 2/ 59-65 Maximum 2/ 59-65		E63 E836
Mermentau River at Lake Arthur, Louisiana	12-14/15-49 10-21/27-50		E39 E642
Bayou Nezpique near Basile, Louisiana	3-28-68	1540	31
Bayou Des Canne near Eunice, Louisiana	3-28-68	29	110
Bayou Teche at Arnaudville, Louisiana	3-27-68 11-16-55	1120 170	65 E159
Bayou Teche at Breaux Bridge, Louisiana	Minimum 58-65 Maximum 58-65		E61 E601
Bayou Teche at Morbinham, Louisiana	9-2-58		E67

Table 144 - Dissolved Solids at Selected Locations in Waters of the Lower Mississippi Region (cont'd)

WRPA 9 (Cont'd)

Stream Sampling Station	Date Collection	Mean Discharge 1/ (cfs)	Dissolved Solids 2/ (mg/l)
Bayou Teche at Olivier, Louisiana	9-2-58		E85
Bayou Teche at Franklin, Louisiana	Minimum 58-65 Maximum 58-65		E125 E688
Bayou Boeuf near Alexandria at Kincad Bridge, Louisiana	8-7-57		E53
Vermilion River at Lafayette, Louisiana	4-5-44		E188
Vermilion River at Lafayette Airport Bridge, Louisiana	Minimum 58-65 Maximum 58-65		E85 E6139
Vermilion River at Abbeville, Louisiana	5-20-53 5-2-53		E43 E307
Vermilion River at Sancker Ferry near Abbeville, Louisiana	3-18/21/24/ 25/30-49 9-9/19-51		E151 E6078
Vermilion River at Perry Bridge, Louisiana	Minimum 58-65 Maximum 58-65		E23 E1341
Atchafalaya River at Simmesport, Louisiana	4-16-53 9-17-52		E159 E330
Atchafalaya River at Krotz Springs, Louisiana	Minimum 58-65 Maximum 58-65 6-1/10-53 12-11/20-53	 367,800 50,260	E167 E627 E129 E322
(Intracoastal Waterway) Bayou Bouef near Morgan City, Louisiana	5-20-56		E333
WRPA 10			
Bayou LaFourche at Donaldsonville, Louisiana	1-19-59 2-27-59	206 208	278 192
Bayou LaFourche at Thibodaux, Louisiana	1-16-59 7-28-59		458 161
Bayou LaFourche at Thibodaux, Louisiana	8-3-56 3-21-56		229 170
Bayou LaFourche at Lockport, Louisiana	3-21-56		170
Bayou LaFourche at Valentine, Louisiana	9-23-59 2-27-59		1,060 108
Bayou LaFourche at Cut-Off, Louisiana	6-23-60 10-27-59		538 276
Bayou Terrebonne at Houma, Louisiana	1-16-59 10-28-58		372 140
Old Intercoastal Waterway at Lockport, Louisiana	4-14-56 8-4-56		398 229

WRPA 10 (Cont'd)

Stream Sampling Station	Date Collection	Mean Discharge 1/ (cfs)	Dissolved Solids 2/ (mg/l)
Old Intercoastal Canal near Bourg, Louisiana	8-4-56 3-21-56		260 224
Intercoastal Waterway, at Houma, Louisiana	8-19-60 10-27-59		365 254
Old Intercoastal Canal at Gayoso, Louisiana	4-25-56 3-21-56		269 206

1/ Where no discharge value is given, none was recorded for the sample.
2/ Where a dissolved solids value is preceded by an E, it means the value was not recorded and was calculated by multiplying specific conductance by 0.65.
3/ Before construction of the Arkansas River navigation project.

parameter (see table footnotes). The very low concentrations of dissolved solids associated with low discharge values tend to indicate a dissolved solids content approaching that of ground water, which generally makes up base flows (as in the sample of 6-28-67 from the Sunflower River at Sunflower, Mississippi, WRPA 4). On the other hand, very high concentrations of dissolved solids associated with a nearly constant mean discharge with low TDS at another sampling (as in the Calcasieu River Moss Bluff - now at U.S. 171 Bridge - Louisiana, WRPA 9) generally indicate a discharge of man-made wastes.

One conclusion to be drawn from the sampling displayed in table 137 is that, outside of some isolated areas, the surface waters in the Lower Mississippi Region are generally good when viewed in terms of the TDS parameter. Only in very rare instances do low mean discharges, usually ground water, produce undesirably high concentrations of dissolved solids. In order to assess future conditions then, it becomes appropriate to look at what can be expected in the way of increases in TDS in the region's waters, not only from sources inside the region as a result of programmed development, but also from outside sources.

The sampling at Hickman, Kentucky, and other locations on the main stem of the Mississippi River indicates no high concentrations of TDS for nearly a 10-year period. These samplings include inflows from all major tributaries to the Mississippi. Examining flows in tributary streams reveals that only WRPA 5 produces low flows with consistently high TDS content.

Federal policy now requires that those who withdraw water from the Nation's surface supplies be held responsible to insure that their return flows have at least as good quality as the withdrawals. This policy (nondegradation), in and of itself, cannot solve dissolved solid problems. Many consumptive uses, such as reservoir and pond evaporation and irrigation, consume water and leave salts to return to streams uncontrolled by the user and, in many cases, incapable of being measured by a regulatory agency. The policy of nondegradation applied to dissolved solids is therefore considered unrealistic in many States. The Lower Mississippi Region, because of its terminal position on the river, is subject to potential problems from dissolved solids, but it is highly unlikely that such problems will be of significant consequence during this century despite the further development expected.

About the only areas where salt concentrations are apt to cause isolated problems are those where significant irrigation projects are expected to continue into the future, as in WRPA 9, where water supplies, both ground and surface, are apt to contain relatively high salt concentrations in the future due to salt-water intrusion. Similar problems are not expected to emerge in WRPA 2, where water quality from the White River is generally low in salt content and will replace ground water as the source of supply for the irrigation of rice and other crops.

Land Development

The most apparent, if not the most significant, impact of development of the region's lands for satisfaction of high priority needs will be a decrease in forested acreage. This may be either good or bad, depending upon a particular viewpoint. Over the 50-year period of study, the satisfaction of land needs for transportaion, urban and built-up, Class A and Class B recreation, minerals, food products, and other agricultural purposes may necessitate the clearing of more than 7.9 million acres of the region's forest lands (10.4 million acres in the absence of future resource development). In spite of this loss in acreage of growing stock, the forest industry, through better management, can expext to achieve required production levels. However, wildlife habitat will suffer. Even without any reduction in forested acreages, expressed needs for wildlife habitat in 2020 exceed present forests by 4.4 million acres. Land clearing for development could increase the deficit to 12.3 million acres (14.8 million acres without future resource development). This does not necessarily mean that hunter participation rates will have to decline, but it does indicate future hunting trips will produce increasingly less game and less sportsman satisfaction. As an ameliorative measure, all need for primary use wildlife management areas will be met by the program.

Other impacts of future land development include increasing flood damages caused by continued development in the region's flood prone areas and the planting of higher value crops. Further short-term effects of land clearing will be increased erosion, increased needs for drainage measures, and increased sediment loads. These effects are expected to be such that dollar damages experienced in 2020 will be roughly the same as at present, even with the full flood control, sediment, erosion, and drainage plans in place.

Problem Amelioration

Inasmuch as program components for the amelioration or elimination of problems have a direct and measurable effect on agricultural production capability, these collective effects can be translated into equivalent acreages of agricultural land. It is thus possible to scale down acreages allocated to agricultural production after assessing the effects of implementation of proposed flood control, drainage,sediment, erosion, and irrigation plans.

To compare with and without program conditions, an analysis was made utilizing a computer model to Analyze Development Effects (ADE). This model was designed by the Economic Research Service to analyze agricultural development possibilities for the base year and for future time frames. ADE allocates a basin's land resources to required production of specified levels of crop output consistent with any specified

level of resource development. In assessing the effects of the formulated plans for resource development, the model run was adjusted so as to translate agricultural damages prevented, and other benefits, into equivalent acreages of agricultural land. This exercise indicated that adjustments on the order of those shown in table 145 can be made and still allow the region's agricultural lands to meet production requirements. Appropriate adjustments have been incorporated into the recommended framework program which is presented in the next section.

Table 145 - Impact of Resource Development on Cropland and Pasture Required to Meet Agricultural Production, Lower Mississippi Region

		Land Required (1,000 Acres)[1/]		
Program	Year	Without Resource Development	With Resource Development	Difference (1,000 Acres)
A	1970	-	26,996	-
	1980	31,219	30,835	384
	2000	33,361	31,869	1,492
	2020	34,939	32,431	2,508
B	1970	-	26,996	-
	1980	31,219	30,835	384
	2000	35,817	33,773	2,044
	2020	37,478	34,716	2,762

1/ Cropland, pastured cropland, and permanent pasture.

RECOMMENDED FRAMEWORK PROGRAM

General

The National Income Program, as amended in this section, is recommended as the framework for future conservation, development, and use of the water and related land resources of the Lower Mississippi Region. Component plans center around the efficient and timely solution of resource problems and needs in harmony with the preservation of important environmental quality features. No specific action plans for stimulating the regional economy are recommended because current national objectives and apparently limited land resource capabilities of the region tend to dictate otherwise.

Resource Use

Water Withdrawals

To assure that the region's water supplies are available for future delivery when and where needed will require development and use of the water resources in general accord with the water withdrawal plan and measures summarized in tables 88 and 89, pages 216 and 219, respectively. That plan, though specifically directed to the satisfaction of needs identified with the National Income Program, is flexible and permits appropriate scaling based on specific authorization studies that would be required for future implementation. As presently scaled, the plan would provide for complete satisfaction of all foreseeable Program A water withdrawal needs through the year 2020.

Water Surface Area

The water surface area plan recommended by the Coordinating Committee is concerned with the conservation, development, and use of the region's existing lakes, ponds, and streams. It is further concerned with the creation of both large and small impoundments.

Existing water bodies, though they cover one out of every 21 acres of the total area of the region, have limited capacity for satisfying future needs for water-oriented recreation, such as boating, swimming, and water skiing. If these recreation needs multiply in line with historic growth trends, their satisfaction will require an increase of 1.3 million acres in the existing supply of water surface areas. This increase takes into account the potential for inter-WRPA commuting by recreationists and the potential for multiple use of reservoirs constructed for flood control, power, water supply, and other purposes (see table 91, page 222, for summary analysis of net needs for man-made water surface-national income objective).

Approximately 81 percent of the required increase in water surface area would be obtainable through the construction of new reservoirs. The remainder (241,000 acres) is unlikely to be provided because of topographic conditions that limit the recognized potential for developing large lakes in the region (see table 92, page 223, for summary of water surface area development potential).

To provide for satisfaction of the region's future needs for water surface areas, the National Income Plan summarized in tables 93 and 94, pages 225 and 226, respectively, is recommended for adoption. Development in general accord with that plan would completely fulfill the 50-year needs for fishing lakes and ponds, and for small recreation lakes (40 to 500 acres in size), and would fulfill to the extent physically possible the needs for recreation lakes of a size larger than 500 acres.

Land Area

The land-use plan for the recommended program is summarized in table 146. It differs from the similar plan for the National Income Program due to incorporated adjustments for the potential impacts of flood control, drainage, supplemental irrigation, and other resource developments which contribute to increased food and fiber production. The adjustments were made in open pasture and forest land. No adjustments were made in the cropland allocation because changing world conditions dictate otherwise.

Regional acreage needs for cropland are believed to be underestimated, and the lands allocated to meet the crop portion of food and fiber requirements, though equal to the expressed need, may prove to be inadequate even with continued water resources development. While the analysis of land needs was correctly and conscientiously done, the exogenously imposed crop production requirements and other seemingly valid assumptions that went into the cropland budgeting model appear to be almost totally invalid in 1974. This condition is reflected in a current price structure that is exerting strong pressures for increased agricultural land use and concomitant water resource development.

The cropland acreage needs, defined in Appendix F, are a theoretical minimum assuming a high degree of mobility land use; i.e., that, in general, each type of crop will gravitate to the best land for that crop, and that highly efficient management will be universally practiced. In actuality, farmers are currently putting as much of their land holdings into crop production as physically possible, subject only to constraints of financing and availability of mechanized farm equipment. In addition, the future regional production requirements imposed by OBERS assume a constant export of agricultural products from about 1980 to 2020, when all evidence is to the contrary. The fact that the United States agricultural industry is much more efficient than that of most other areas of the world, coupled with the large highly productive land resource base of this Nation, place it in a most favorable position for increasing

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 1				
Open Land				
Transportation, Urban and Built-up	-	-	-	-
Food and Fiber				
Cropland	188.0	188.0	188.0	188.0
Pastured Cropland	30.0	30.0	30.0	30.0
Permanent Pasture	32.0	32.0	32.0	32.0
Other	62.0	62.0	62.0	62.0
Commercial Fisheries	-	-	-	-
Minerals	-	-	-	-
Recreation				
Class A	-	-	-	-
Class B	-	-	-	-
Fish and Wildlife				
(Cropland)	-	-	-	-
(Pastureland)	-	-	-	-
(Wetlands)	-	-	-	-
Environmental Quality	-	-	-	-
Forest Land				
Food and Fiber				
Forest Products, et al.	879.0	879.0	879.0	879.0
Animal Roughage (Pasture)1/	(135.0)	(135.0)	(135.0)	(368.0)
Recreation				
Class B	-	-	-	-
Class C	-	-	-	-
Fish and Wildlife2/	(131.1)	(131.1)	(131.0)	(131.0)
Environmental Quality				
Botanical Systems	-	-	-	-
Bottomland Hardwoods1/	(879.0)	(879.0)	(879.0)	(879.0)
Ecological Systems	-	-	-	-
Geological Systems	-	-	-	-
Lake Shores1/	-	(6.0)	(6.0)	(6.0)
Scenic River Banks	-	-	-	-
Wetlands	-	-	-	-
Wilderness Areas	-	-	-	-
Land Covered by Water				
Large Water Areas	368.0	368.0	368.0	368.0
Small Water Areas	-	-	-	-
Total Area, WRPA 1	1,559.0	1,559.0	1,559.0	1,559.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 2				
Open Land				
Transportation, Urban and Built-up	367.0	378.0	396.0	459.0
Food and Fiber				
Cropland	6,192.0	7,201.0	7,618.0	7,761.0
Pastured Cropland	380.0	476.0	442.0	420.0
Permanent Pasture	693.0	308.0	284.0	267.0
Other	247.0	379.0	253.0	174.0
Commercial Fisheries[3/]	(16.0)	(21.0)	(30.0)	(40.0)
Minerals[3/]	(26.0)	(35.0)	(56.0)	(87.0)
Recreation				
Class A[4/]	(6.1)	(7.1)	(8.4)	(12.1)
Class B[5/]	(7.1)	(7.5)	(7.5)	(10.4)
Fish and Wildlife				
(Cropland)[6/]	-	(288.0)	(319.0)	(375.0)
(Pastureland)[5/]	-	(123.0)	(137.0)	(161.0)
(Wetlands)[3/]	-	(101.0)	(101.0)	(101.0)
Environmental Quality				
Open and Green Space[7/]	(6.1)	(8.0)	(8.0)	(8.0)
Ecological Systems[8/]		1.0	1.0	1.0
Geological Systems[5/]	-	(157.0)	(157.0)	(157.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,634.0	1,697.0	1,432.0	1,305.0
Animal Roughage (Pasture)[1/]	(365.0)	(447.0)	(454.0)	(775.0)
Recreation				
Class B[1/]	(7.0)	(7.6)	(7.6)	(10.4)
Class C[1/]	(0.6)	(0.6)	(0.7)	(0.9)
Fish and Wildlife[2/]	(280.5)	(381.0)	(444.6)	(535.3)
Environmental Quality				
Bottomland Hardwoods[1/]	(1,128.0)	(670.0)	(510.0)	(424.0)
Ecological Systems[1/]		(100.0)	(100.0)	(100.0)
Ecological Systems[8/]		(10.0)	(10.0)	(10.0)
Geological Systems[1/]		(330.0)	(330.0)	(330.0)
Lake Shores[1/]		(1.0)	(1.0)	(1.0)
Scenic River Banks[1/]		(18.0)	(18.0)	(18.0)
Wilderness Areas[8/]		(30.0)	(30.0)	(30.0)
Land Covered by Water				
Large Water Areas	91.0	124.0	138.0	177.0
Small Water Areas	98.0	98.0	98.0	98.0
Total Area, WRPA 2	10,702.0	10,702.0	10,702.0	10,702.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 3				
Open Land				
Transportation, Urban and Built-up	355.0	401.0	536.0	724.0
Food and Fiber				
Cropland	2,206.0	2,094.0	2,170.0	2,346.0
Pastured Cropland	746.0	1,062.0	1,069.0	1,075.0
Permanent Pasture	929.0	491.0	490.0	477.0
Other	200.0	392.0	379.0	354.0
Commercial Fisheries 3/	(0.6)	(1.0)	(2.0)	(3.0)
Minerals 3/	(2.0)	(4.0)	(9.0)	(14.0)
Recreation				
Class A 4/	(2.9)	(13.8)	(23.5)	(39.0)
Class B 5/	(2.4)	(11.9)	(20.2)	(33.6)
Fish and Wildlife				
(Cropland) 6/	-	(652.0)	(890.0)	(1,214.0)
(Pastureland) 5/	-	(279.0)	(380.0)	(520.0)
(Wetlands) 3/	-	(41.0)	(41.0)	(41.0)
Environmental Quality 7/	(2.9)	(34.0)	(34.0)	(34.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,310.0	2,120.0	1,710.0	1,188.0
Animal Roughage (Pasture 1/	(297.0)	(464.0)	(921.0)	(551.0)
Recreation				
Class B 1/	(2.3)	(11.9)	(20.3)	(33.6)
Class C 1/	(0.2)	(1.2)	(1.9)	(3.0)
Fish and Wildlife 2/	(186.3)	(228.1)	(266.2)	(320.5)
Environmental Quality				
Bottomland Hardwoods 1/	(796.0)	(699.0)	(502.0)	(443.0)
Lake Shores 8/		1.0	1.0	1.0
Scenic River Banks 1/		(28.0)	(28.0)	(28.0)
Wetlands 1/		(64.0)	(64.0)	(64.0)
Land Covered by Water				
Large Water Areas	40.0	225.0	431.0	621.0
Small Water Areas	32.0	32.0	32.0	32.0
Total Area, WRPA 3	6,818.0	6,818.0	6,818.0	6,818.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 4				
Open Land				
Transportation, Urban and Built-up	328.0	335.0	361.0	426.0
Food and Fiber				
Cropland	3,314.0	3,545.0	4,274.0	4,423.0
Pastured Cropland	326.0	550.0	511.0	486.0
Permanent Pasture	943.0	1,783.0	1,520.0	1,459.0
Other	207.0	253.0	230.0	163.0
Commercial Fisheries[3/]	(11.3)	(20.0)	(37.0)	(54.0)
Minerals[3/]	(3.0)	(3.0)	(4.0)	(5.0)
Recreation				
Class A[4/]	(0.8)	(3.8)	(5.4)	(8.0)
Class B[5/]	(1.0)	(3.1)	(4.4)	(6.5)
Fish and Wildlife				
(Cropland)[6/]	-	(292.0)	(327.0)	(391.0)
(Pastureland)[5/]	-	(125.0)	(140.0)	(167.0)
(Wetlands)[3/]	-	(97.0)	(97.0)	(97.0)
Environmental Quality[7/]	(0.8)	(8.0)	(8.0)	(8.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	3,222.0	1,830.0	1,331.0	1,230.0
Animal Roughage (Pasture)[1/]	(587.0)	(1,073.0)	(875.0)	(800.0
Recreation				
Class B[1/]	(0.9)	(3.1)	(4.4)	(6.5)
Class C[1/]	(26.0)	(26.0)	(32.1)	(45.5)
Fish and Wildlife[2/]	(165.4)	(257.6)	(300.6)	(361.9)
Environmental Quality				
Bottomland Hardwoods[1/]	(1,148.0)	(932.0)	(932.0)	(932.0)
Ecological Systems[8/]		10.0	10.0	10.0
Geological Systems[8/]		1.0	1.0	1.0
Lake Shores[1/]		(2.0)	(2.0)	(2.0)
Wilderness Areas[8/]		5.0	5.0	5.0
Land Covered by Water				
Large Water Areas	74.0	102.0	171.0	211.0
Small Water Areas	133.0	133.0	133.0	133.0
Total Area, WRPA 4	8,547.0	8,547.0	8,547.0	8,547.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 5				
Open Land				
Transportation,				
Urban and Built-up	440.0	458.0	532.0	647.0
Food and Fiber				
Cropland	732.0	755.0	794.0	1,019.0
Pastured Cropland	239.0	607.0	568.0	564.0
Permanent Pasture	982.0	854.0	801.0	793.0
Other	192.0	257.0	235.0	203.0
Commercial Fisheries 3/	(3.6)	(6.0)	(12.0)	(18.0)
Minerals 2/	(8.0)	(9.0)	(9.0)	(10.0)
Recreation				
Class A 4/	(2.6)	(6.1)	(9.1)	(13.5)
Class B 5/	(2.3)	(5.2)	(7.7)	(11.5)
Fish and Wildlife				
(Cropland) 6/	-	(394.0)	(467.0)	(572.0)
(Pastureland) 5/	-	(169.0)	(200.0)	(245.0)
Environmental Quality 7/	(2.6)	(13.0)	(13.0)	(13.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	10,228.0	9,777.0	9,756.0	9,388.0
Animal Roughage (Pasture) 1/	(947.0)	(1,048.0)	(1,090.0	(1,515.0)
Recreation				
Class B 1/	(2.2)	(5.3)	(7.5)	(11.6)
Class C 1/	(23.8)	(23.8)	(31.5)	(46.9)
Fish and Wildlife				
Management Areas, etc. 2/	(258.4)	(361.9)	(422.3)	(508.5)
Wetlands 1/	-	(531.0)	(723.0)	(791.0)
Environmental Quality				
Bottomland Hardwoods 1/	(2,362.0)	(2,269.0)	(2,247.0)	(2,156.0)
Ecological Systems 1/		(15.0)	(15.0)	(15.0)
Ecological Systems 8/		5.0	5.0	5.0
Geological Systems 8/		22.0	22.0	22.0
Lake Shores 1/		(1.0)	(1.0)	(1.0)
Scenic River Banks 1/		(28.0)	(28.0)	(28.0)
Wilderness Areas 8/		(20.0)	(20.0)	(20.0)
Land Covered by Water				
Large Water Areas	175.0	233.0	255.0	327.0
Small Water Areas	76.0	76.0	76.0	76.0
Total Area, WRPA 5	13,064.0	13,064.0	13,064.0	13,064.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 6				
Open Land				
Transportation,				
Urban and Built-up	78.0	79.0	79.0	80.0
Food and Fiber				
Cropland	1,908.0	2,100.0	2,140.0	2,187.0
Pastured Cropland	118.0	132.0	124.0	112.0
Permanent Pasture	494.0	458.0	419.0	382.0
Other	32.0	40.0	47.0	49.0
Commercial Fisheries 3/	(1.4)	(4.0)	(9.0)	(14.0)
Minerals 3/	(2.0)	(2.0)	(3.0)	(4.0)
Recreation				
Class A 4/	(0.5)	(1.7)	(2.2)	(2.9)
Class B 5/	(0.4)	(1.5)	(1.9)	(2.5)
Fish and Wildlife				
(Cropland) 6/	-	(83.0)	(83.0)	(91.0)
(Pastureland) 5/	-	(35.0)	(36.0)	(39.0)
Environmental Quality				
Open and Green Space 7/	(0.5)	(2.0)	(2.0)	(2.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	831.0	652.0	650.0	639.0
Animal Roughage (Pasture) 1/	(117.0)	(224.0)	(234.0)	(415.0)
Recreation				
Class B 1/	(0.3)	(1.5)	(1.9)	(2.6)
Class C 1/	(0.0)	(0.2)	(0.2)	(0.2)
Fish and Wildlife				
Management Areas, etc. 2/	(45.2)	(70.2)	(81.9)	(98.6)
Wetlands 1/	-	(85.0)	(85.0)	(85.0)
Environmental Quality				
Bottomland Hardwoods 1/	(756.0)	(609.0)	(609.0)	(609.0)
Land Covered by Water				
Large Water Areas	32.0	32.0	34.0	44.0
Small Water Areas	40.0	40.0	40.0	40.0
Total Area, WRPA 6	3,533.0	3,533.0	3,533.0	3,533.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 7				
Open Land				
Transportation, Urban and Built-up	116.0	121.0	136.0	151.0
Food and Fiber				
Cropland	337.0	197.0	147.0	138.0
Pastured Cropland	180.0	300.0	406.0	455.0
Permanent Pasture	941.0	998.0	1,356.0	1,453.0
Other	30.0	68.0	49.0	12.0
Commercial Fisheries3/	(0.9)	(1.0)	(3.0)	(4.0)
Minerals3/	(1.0)	(1.0)	(1.0)	(1.0)
Recreation				
Class A4/	(0.4)	(1.6)	(2.2)	(3.3)
Class B5/	(0.4)	(1.3)	(1.9)	(2.8)
Fish and Wildlife				
(Cropland)6/	-	(74.0)	(85.0)	(103.0)
(Pastureland)5/	-	(32.0)	(36.0)	(44.0)
Environmental Quality7/	(0.4)	(1.0)	(1.0)	(1.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	2,509.0	2,343.0	1,830.0	1,715.0
Animal Roughage (Pasture)1/	(694.0)	(1,251.0)	(895.0)	(580.0)
Recreation				
Class B	(0.3)	(1.4)	(2.0)	(2.9)
Class C	(0.1)	(0.1)	(0.2)	(0.3)
Fish and Wildlife				
Management Areas, etc.2/	(74.0)	(104.0)	(121.4)	(146.1)
Wetlands1/	-	(49.0)	(49.0)	(49.0)
Environmental Quality				
Bottomland Hardwoods1/	(500.0)	(442.0)	(386.0)	(386.0)
Ecological Systems8/		3.0	3.0	3.0
Geological Systems8/		1.0	1.0	1.0
Lake Shores1/		(1.0)	(1.0)	(1.0)
Scenic River Banks1/		(13.0)	(13.0)	(13.0)
Wilderness Areas8/		27.0	27.0	27.0
Land Covered by Water				
Large Water Areas	38.0	93.0	196.0	196.0
Small Water Areas	56.0	56.0	56.0	56.0
Total Area, WRPA 7	4,207.0	4,207.0	4,207.0	4,207.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 8				
Open Land				
Transportation, Urban and Built-up	182.0	206.0	260.0	333.0
Food and Fiber				
Cropland	329.0	217.0	170.0	193.0
Pastured Cropland	54.0	332.0	322.0	320.0
Permanent Pasture	655.0	576.0	548.0	532.0
Other	48.0	59.0	47.0	21.0
Commercial Fisheries 3/	(0.3)	(1.0)	(1.0)	(2.0)
Minerals 3/	(4.0)	(5.0)	(6.0)	(8.0)
Recreation				
Class A 4/	(0.5)	(6.0)	(9.6)	(15.3)
Class B 5/	(0.9)	(5.2)	(8.3)	(13.1)
Fish and Wildlife				
(Cropland) 6/	-	(217.0)	(170.0)	(193.0)
(Pastureland) 5/	-	(122.0)	(156.0)	(262.0)
Environmental Quality				
Open and Green Space 7/	(0.5)	(12.0)	(12.0)	(12.0)
Botanical Systems 8/	-	0.1	0.1	0.1
Geological Systems 8/	-	0.8	0.8	0.8
Forest Land				
Food and Fiber				
Forest Products, et al.	2,265.0	2,123.8	2,144.8	2,051.8
Animal Roughage (Pasture) 1/	(650.0)	(615.0)	(1,183.0)	(1,213.0)
Recreation				
Class B	(0.8)	(5.2)	(8.3)	(13.2)
Class C	(0.0)	(0.5)	(0.8)	(1.2)
Fish and Wildlife				
Management Areas, etc. 2/	(5.0)	(19.0)	(22.2)	(26.7)
Wetlands 1/	-	(144.0)	(190.0)	(395.0)
Environmental Quality				
Botanical Systems 8/	-	1.6	1.6	1.6
Bottomland Hardwoods 1/	(988.0)	(913.8)	(885.8)	(811.8)
Geological Systems 1/	-	(200.0)	(200.0)	(200.0)
Geological Systems 8/	-	1.7	1.7	1.7
Lake Shores 1/	-	(1.0)	(1.0)	(1.0)
Scenic River Banks 1/	-	(17.0)	(17.0)	(17.0)
Land Covered by Water				
Large Water Areas	73.0	88.0	110.0	151.0
Small Water Areas	45.0	45.0	45.0	45.0
Total Area, WRPA 8	3,651.0	3,651.0	3,651.0	3,651.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 9				
Open Land				
Transportation, Urban and Built-up	236.0	243.0	271.0	314.0
Food and Fiber				
Cropland	1,827.0	2,635.0	2,623.0	2,578.0
Pastured Cropland	749.0	1,232.0	1,214.0	1,186.0
Permanent Pasture	911.0	1,036.0	1,002.0	965.0
Other	807.0	734.0	752.0	787.0
Commercial Fisheries 3/	(10.7)	(14.0)	(20.0)	(26.0)
Minerals 3/	(7.0)	(11.0)	(16.0)	(24.0)
Recreation				
Class A 4/	(1.3)	(7.5)	(10.6)	(15.1)
Class B 5/	(1.0)	(6.4)	(9.1)	(13.0)
Fish and Wildlife				
(Cropland) 6/	-	(829.0)	(1,216.0)	(1,636.0)
(Pastureland) 5/	-	(153.0)	(172.0)	(202.0)
(Wetlands) 3/	-	(144.0)	(162.0)	(190.0)
Environmental Quality				
Open and Green Space 7/	(1.3)	(12.0)	(12.0)	(12.0)
Beaches and Shores 3/	-	(16.0)	(16.0)	(16.0)
Botanical Systems 3/	-	(500.0)	(500.0)	(500.0)
Geological Systems 8/	-	2.6	2.6	2.6
Forest Land				
Food and Fiber				
Forest Products, et al.	3,442.0	1,925.4	1,907.4	1,889.4
Animal Roughage (Pasture) 1/	(383.0)	(677.0)	(711.0)	(751.0)
Recreation				
Class B	(0.9)	(6.5)	(9.2)	(13.0)
Class C	(0.2)	(0.6)	(0.9)	(1.1)
Fish and Wildlife 2/	(690.2)	(717.2)	(836.9)	(1,007.7)
Environmental Quality				
Botanical Systems 1/	-	(233.0)	(233.0)	(233.0)
Botanical Systems 8/	-	57.0	57.0	57.0
Bottomland Hardwoods 1/	(1,324.0)	(918.0)	(918.0)	(918.0)
Geological Systems 8/	-	3.0	3.0	3.0
Lake Shores 1/	-	(3.0)	(3.0)	(3.0)
Scenic River Banks 1/	-	(9.0)	(9.0)	(9.0)
Wetlands 1/	-	(121.0)	(121.0)	(121.0)
Wilderness Areas 1/	-	(453.0)	(453.0)	(453.0)
Wilderness Areas 8/	-	102.0	102.0	102.0
Land Covered by Water				
Large Water Areas	400.0	402.0	438.0	488.0
Small Water Areas	138.0	138.0	138.0	138.0
Total Area, WRPA 9	8,510.0	8,510.0	8,510.0	8,510.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA 10				
Open Land				
Transportation, Urban and Built-up	230.0	260.0	327.0	419.0
Food and Fiber				
Cropland	310.0	271.0	250.0	242.0
Pastured Cropland	49.0	86.0	83.0	82.0
Permanent Pasture	202.0	289.0	274.0	266.0
Other	1,681.0	1,671.0	1,664.0	1,653.0
Commercial Fisheries3/	(1.2)	(2.0)	(3.0)	(3.0)
Minerals3/	(14.0)	(17.0)	(23.0)	(30.0)
Recreation				
Class A4/	(1.3)	(14.4)	(23.0)	(36.3)
Class B5/	(0.9)	(12.4)	(19.8)	(31.2)
Fish and Wildlife				
(Cropland)6/	-	(271.0)	(250.0)	(242.0)
(Pastureland)5/	-	(291.0)	(372.0)	(424.0)
(Wetlands)3/	-	(275.0)	(353.0)	(530.0)
Environmental Quality				
Open and Green Space7/	(1.3)	(31.0)	(31.0)	(31.0)
Beaches and Shores3/	-	(160.0)	(160.0)	(160.0)
Forest Land				
Food and Fiber				
Forest Products, et al.	1,317.0	1,211.0	1,187.0	1,116.0
Animal Roughage (Pasture)1/	(32.0)	(59.0)	(62.0)	(65.0)
Recreation				
Class B	(0.8)	(12.5)	(19.8)	(31.2)
Class C	(0.0)	(1.2)	(1.8)	(2.7)
Fish and Wildlife2/	(185.3)	(196.3)	(229.1)	(275.8)
Environmental Quality				
Botanical Systems1/	-	1.0	1.0	1.0
Bottomland Hardwoods1/	(970.0)	(885.0)	(841.0)	(780.0)
Lake Shores1/	-	(4.0)	(4.0)	(4.0)
Scenic River Banks	-	(4.0)	(4.0)	(4.0)
Land Covered by Water				
Large Water Areas	939.0	939.0	942.0	949.0
Small Water AReas	219.0	219.0	219.0	219.0
Total Area, WRPA 10	4,947.0	4,947.0	4,947.0	4,947.0

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA's 1 through 10				
Open Land				
Transportation				
Urban and Built-up	2,332.0	2,481.0	2,898.0	3.553.0
Food and Fiber				
Cropland	17,343.0	19,203.0	20,374.0	21,075.0
Pastured Cropland	2,871.0	4,807.0	4,769.0	4,730.0
Permanent Pasture	6,782.0	6,825.0	6,726.0	6,626.0
Other	3,506.0	3,915.0	3,718.0	3,478.0
Commercial Fisheries3/	(46.0)	(70.0)	(117.0)	(164.0)
Minerals3/	(67.0)	(87.0)	(127.0)	(183.0)
Recreation				
Class A4/	(16.4)	(62.0)	(94.0)	(145.5)
Class B5/	(16.0)	(54.5)	(80.8)	(124.6)
Fish and Wildlife				
(Cropland)6/	-	(3,100.0)	(3,807.0)	(4,817.0)
(Pastureland)5/	-	(1,329.0)	(1,629.0)	(2,064.0)
(Wetlands)3/	-	(658.0)	(754.0)	(959.0)
Environmental Quality				
Open and Green Space7/	(16.4)	(122.0)	(122.0)	(122.0)
Beaches and Shores3/	-	(176.0)	(176.0)	(176.0)
Botanical Systems3/	-	(500.0)	(500.0)	(500.0)
Botanical Systems8/	-	0.1	0.1	0.1
Ecological Systems8/	-	1.0	1.0	1.0
Geological Systems5/	-	(157.0)	(157.0)	(157.0)
Geological Systems8/	-	3.4	3.4	3.4
Forest Land				
Food and Fiber				
Forest Products, et al.	29,637.0	24,558.2	22,827.2	21,401.2
Animal Roughage (Pasture)1/	(4,207.0)	(5,993.0)	(6,560.0)	(7,033.0)
Recreation				
Class B1/	(15.9)	(55.0)	(81.3)	(125.0)
Class C1/	(50.9)	(54.2)	(70.1)	(101.8)
Fish and Wildlife				
Management Areas, etc.2/	(2,021.4)	(2,466.4)	(2,856.2)	(3,418.2)
Wetlands1/	-	(809.0)	(1,047.0)	(1,320.0)

Table 146 - Land Use Plan, Recommended Program, Lower Mississippi Region (cont'd)

Water Resources Planning Area and Need Category	1970 Land Use (1,000 Acres)	Allocated Future Land Use (1,000 Acres) 1980	2000	2020
WRPA's 1 through 10 (cont'd)				
Environmental Quality				
Botanical Systems1/	-	(293.0)	(293.0)	(293.0)
Botanical Systems8/	-	59.6	59.6	59.6
Bottomland Hardwoods1/	(10,852.0)	(9,147.8)	(8,640.8)	(8,096.8)
Ecological Systems1/	-	(115.0)	(115.0)	(115.0)
Ecological Systems8/	-	28.0	28.0	28.0
Geological Systems1/	-	(530.0)	(530.0)	(530.0)
Geological Systems8/	-	28.7	28.7	28.7
Lake Shores1/	-	(19.0)	(19.0)	(19.0)
Lake Shores8/	-	1.0	1.0	1.0
Scenic River Banks1/	-	(117.0)	(117.0)	(117.0)
Wetlands1/	-	(185.0)	(185.0)	(185.0)
Wilderness Areas1/	-	(453.0)	(453.0)	(453.0)
Wilderness Areas8/	-	184.0	184.0	184.0
Land Covered by Water				
Large Water Areas	2,230.0	2,606.0	3,083.0	3,532.0
Small Water Areas	837.0	837.0	837.0	837.0
Total Area, LMR	65,538.0	65,538.0	65,538.0	65,538.0

1/ Multiple-use land. Counted in forest products acreage.
2/ Primary use for fish and wildlife. Counted in forest products acreage.
3/ Multiple-use land. Counted in other open land acreage.
4/ Primary use for recreation. Counted in transportation, urban and built-up acreage.
5/ Multiple-use land counted in pasture acreage.
6/ Multiple-use land. Counted in cropland acreage.
7/ Multiple-use with Class A recreation land. Counted in transportation, urban and built-up acreage.
8/ Exclusive use for environmental quality purposes. Not counted elsewhere.

export of food and fiber to the rest of the world - a world suffering from shortages of food for a rapidly expanding population. Furthermore, all indications are that it will be necessary to continue the export of agricultural products in large quantities in order to maintain a favorable international balance of payments. In summary, it is highly likely that this Nation's crop production - a substantial part of which will continue to come from the Lower Mississippi Region - will be called upon to meet an ever-increasing share of the world's food needs, and that the future cropland needs herein defined on a lesser criteria are understated. Because of this, any reduction in acreages allocated to cropland would be irresponsible. Instead of the normal consideration given to reduction of cropland acreage which can be achieved by implementation of flood control, drainage, supplemental irrigation, and other plans, it must be concluded that implementation of those programs is imperative to at least partially offset serious inadequacies in the region's capability to produce food and fiber consistent with current conditions.

However, reductions can be made in pasture land allocations without materially affecting attainment of the region's food and fiber production goals. In evaluating the impacts of future water resource developments for the National Income Program, it was determined that 0.4, 1.5, and 2.5 million acres of open agricultural land could be reallocated to other uses in the years 1980, 2000, and 2020, respectively. Adjustments in open pasture land and forest acreages for the Recommended Program have been made accordingly.

The entire reduction has been made in the open pasture lands category for three reasons: (1) open pasture lands reallocated to forest land can still be pastured, with about 2 acres of managed pastured forests having the productive capability of 1 acre of open pasture. Thus, the exchange of 2.5 million acres of permanent pasture and pastured cropland for pastured forest is equivalent to reducing the region's productive pasture capability by only 1.25 million acres, or about 15 percent; (2) the "efficiency of use" implicit in the basic open pasture land needs takes into account the use of management techniques such as clipping, seeding, and fertilization, with no allowance for feed lots as an additional management tool. The use of feed lots is common in other beef-producing areas of the country. If this practice should spread to the Lower Mississippi Region, it could help to offset the loss of 1.25 million equivalent acres of permanent pasture; and (3) some increased efficiency in food production from permanent and wooded pasture will no doubt result from the various development plans for flood control, drainage, land treatment, etc., that are an essential part of the recommended program.

Food and fiber production requirements for pasture should be met on the reduced acreage so that remaining forest-land acreage will be greater. The increase in forests will allow satisfaction of other needs, such as wildlife habitat, recreation, and timber production. The result is a more desirable environmental and ecological balance which adds diversity to the land allocation for the recommended program.

Recreation, Fish and Wildlife, and Environmental Quality

The plans recommended for the satisfaction of recreation and fish and wildlife needs are summarized in the discussion of the National Income Program (pages 250 through 269). Table 99 provides details on the WRPA composition of the recreation plan; details on the fish and wildlife plan are given in table 101. The recommended plan for environmental quality provides for the regulated use of 1.3 million acres of land, of which 305,400 acres are designated for exclusive use for this purpose. The exclusive use acreages are listed by WRPA and environmental feature in table 147. They are denoted by parentheses in table 148, which gives a summary of the environmental quality plan.

Within the context of the recommended program, exclusive use for environmental quality purposes would not only preclude the clearing of forest lands for agricultural, urban, and other purposes, but would also preclude the use of those lands for timber production. However, it should not be interpreted as precluding temporary overflows for flood control or other beneficial purposes, as in the case of lands in the Atchafalaya floodway.

Problem Amelioration

Plans recommended for flood control, sediment and erosion control, land drainage, water quality control, navigation, and power are directed to the solution of problems evaluated for the National Income Program. The plans are detailed elsewhere. Table 149 gives a listing of these individual plans, with cross references to their locations in earlier sections of this appendix. Plans for the coastal and estuarine zone, plans associated with archeological and historical resources, and plans dealing with health aspects do not vary with program objective. These components of the recommended program components have only been mentioned in connection with the alternative program; details reserved for presentation in this section are given below.

Coastal and Estuarine

The coastal and estuarine plan, identical for all formulated programs, consists of measures having a reasonable possibility of being implemented in the prescribed time frames. The measures favor the improvement of the coastal and estuarine environment because they are designed to enhance the productivity of fish and wildlife by alleviating land loss, preventing salinity intrusion, preventing shoreline erosion, and establishing adequate water levels.

Solutions to the region's coastal and estuarine problems, as relates to these parameters, have been the subject of intensive research. The most recent study is scheduled for completion in calendar year 1975. As postulated in these studies and supported in the Coastal and Estuarine Appendix, solutions to problems in the region's estuarine zone (1) must be approached on a coastal-wide basis, and (2) all needs, with the exception of those relating to shoreline erosion, can best be be expressed in terms of Mississippi River flows. In general, the costs

Table 147 - Lands Designated for Exclusive Use as Environmental Quality Components, Recommended Program, Lower Mississippi Region

WRPA	Feature	Land Area (Acres)	Existing Classification	Environmental Quality Attribute(s)
1	None	-	-	-
2	Grand Prairie	1,000	Pasture	Ecological System
	Dismal Swamp	4,000	Forest	Ecological System
	Dark Cypress Swamp	4,000	Forest[1/]	Ecological System
	Arnet Shutin	1,000	Forest[1/]	Ecological System
	Mill Stream Shutin	1,000	Forest[1/]	Ecological System
	Crowley's Ridge	20,000	Forest	Wilderness Area
	Lower White River	10,000	Forest[1/]	Wilderness Area
	Subtotal	41,000		
3	Reelfoot Lake	400	Fish & Wildlife	Scenic natural lake with unique ecological and geological features
	Murphy's Pond	100	Fish & Wildlife	Scenic lake and unique ecological system
	Open Lake	500	Fish & Wildlife	Scenic lake and unique ecological system
	Subtotal	1,000		
4	Sharkey Bayou Area	2,500	Forest[1/]	Ecological System
	Mathews Brake	700	Forest[1/]	Ecological System
	Dutch Brake	700	Forest[1/]	Ecological System
	Blue Lake Brake	800	Forest[1/]	Ecological System
	Ashland Brake	1,000	Forest[1/]	Ecological System
	Beckham Brake	1,000	Forest[1/]	Ecological System
	Gayden Brake	1,100	Forest[1/]	Ecological System
	Eagle Brake	900	Forest[1/]	Ecological System
	Alcorn Brake	800	Forest[1/]	Ecological System
	McIntyre Lake Area	400	Forest[1/]	Ecological System
	Delta National Forest	5,000	Forest	Wilderness Area
	Delta Bluff Hills	1,100	Forest	Geological System
	Subtotal	16,000		

Table 147 - Lands Designated for Exclusive Use as Environmental Quality Components, Recommended Program, Lower Mississippi Region (cont'd)

WRPA	Feature	Land Area (Acres)	Existing Classification	Environmental Quality Attribute(s)
5	Seven Devil's Swamp	5,000	Forest 1/	Ecological System and Wilderness Area
	Diamond Mine in Pike County, Ark.	500	Forest	Geologic System
	Magnet Cove Crater	7,000	Forest	Geologic System
	Caney Salt Mine near Winnfield, La.	300	Forest	Geologic System
	Winnfield Marble Rock Quarry	300	Forest	Geologic System
	Mosley's Bluff along Bayou D'Arbonne in Union Parish, La.	1,600	Forest	Geologic System
	Sicily Island, Catahoula Parish, La.	10,000	Forest	Geologic System
	Chalk Deposit below Columbia, La.	100	Forest	Geologic System
	Salt Springs, Catahoula Lake	100	Forest	Geologic System
	Bunker Hill - Grandview Bluff, above Danville, La.	290	Forest	Geologic System
	Rock Outcropping, Ouachita River	50	Forest	Geologic System
	Jordan Mountain, Bienville Parish, La.	500	Forest	Geologic System
	Driscoll Mountain, Bienville Parish, La.	500	Forest	Geologic System
	Waterfall, Grant Parish, La.	20	Forest	Geologic System
	Monelo Gap on Red River	100	Forest	Geologic System
	Bluff Banks on Ouachita River	200	Forest	Geologic System
	Felsenthal Basin	5,000	Forest 1/	Wilderness Area
	Dismal Swamp	5,000	Forest 1/	Wilderness Area
	Ouachita National Forest	5,000	Forest	Wilderness Area
	Kisahatchie National Forest	5,000	Forest	Wilderness Area
	Subtotal	46,560		

Table 147 - Lands Designated for Exclusive Use as Environmental Quality Components, Recommended Program, Lower Mississippi Region (cont'd)

WRPA	Feature	Land Area (Acres)	Existing Classification	Environmental Quality Attribute(s)
6	None	-	-	-
7	Foster Lake Area on Buffalo River	3,000	Forest1/	Ecological System
	Loess Bluff Hills near Vicksburg, Miss.	1,000	Forest1/	Geologic System
	Foster Lake Area on Buffalo River	7,000	Forest1/	Wilderness Area
	Grand Gulf	10,000	Forest1/	Wilderness Area
	Homochitto National Forest	10,000	Forest	Wilderness Area
	Subtotal	31,000		
8	Port Hudson - East Baton Rouge Parish, La.	100	"Other"	Botanical System
	Chipola Area and Pine Stands - St. Helena Parish, La.	100	Forest	Botanical System
	Clio-Livingston Parish, La.	500	Forest1/	Botanical System
	Spruce Pine Stands in Livingston and Tangipaho Parishes, La.	1,000	Forest	Botanical System
	Waterfalls - vicinity of Pond, Miss.	50	Pasture	Geological System
	Bayou Sara - Percy Bluff	200	Pasture	Geological System
	The Plains	500	Pasture	Geological System
	Bluff near Hatchers Quarters	100	Forest1/	Geological System
	Fluker's Gorge	500	Forest1/	Geological System
	Tar Pits - Feliciana Parish, La.	500	Forest1/	Geological System
	Bluffs and Slump Blocks overlooking Mississippi River	500	Forest1/	Geological System
	Prehistoric Logs - East Baton Rouge Parish, La.	100	Forest1/	Geological System
	Subtotal	4,150		

Table 147 - Lands Designated for Exclusive Use as Environmental Quality Components, Recommended Program, Lower Mississippi Region (cont'd)

WRPA	Feature	Land Area (Acres)	Existing Classification	Environmental Quality Attribute(s)
9	Sangamar Beach Ridge	3,000	Forest1/	Geological System
	Atchafalaya Floodway	102,000	Forest1/	Wilderness Area
	Morganza Floodway	42,000	Forest1/	Wetlands
	Chenier Au Tigre	15,000	Forest1/	Wetlands
	Avery Island	500	"Other"	Geological System
	Jefferson Island	500	"Other"	Geological System
	Belle Isle	100	"Other"	Geological System
	Pecan Island	50	"Other"	Geological System
	Grand Chenier	50	"Other"	Geological System
	Barrier Beach in Cameron Parish, La.	50	"Other"	Geological System
	Hot Wells, near Alexandria, La.	30	"Other"	Geological System
	Bell Chaney Springs	20	"Other"	Geological System
	Weeks Isle	500	"Other"	Geological System
	Cote Blanche	200	"Other"	Geological System
	Pomme de Terre	600	"Other"	Geological System
	Subtotal	164,600		
10	Avondale	200	Forest	Botanical System
	Spruce Pine Stand in St. Tammany Parish, La.	800	Forest	Botanical System
	Subtotal	1,000		
	Total	305,400		

1/ Bottom-land hardwood forest.

Table 148 - Environmental Quality Plan, Recommended Program, Lower Mississippi Region

Resource Feature	1980 Primary Use[1] Established	1980 Primary Use[1] New	1980 Secondary Use	1980 Total Use	2000 Primary Use	2000 Secondary Use	2000 Total Use	2020 Primary Use	2020 Secondary Use	2020 Total Use
	Resource Use (1,000 Acres)									
WRPA 1										
Land										
Bottomland Hardwood Forests	-	-	873.0	873.0	-	873.0	873.0	-	873.0	873.0
Lake Shorelines	-	6.0	-	6.0	6.0	-	6.0	6.0	-	6.0
Total Land	--	6.0	873.0	879.0	6.0	873.0	879.0	6.0	873.0	879.0
Water Surface Area										
Lakes	36.0	4.0	-	40.0	40.0	-	40.0	40.0	-	40.0
Scenic Rivers	-	-	-	-	-	-	-	-	-	-
Total Water Surface	36.0	4.0	-	40.0	40.0	-	40.0	40.0	-	40.0
WRPA 2										
Land										
Bottomland Hardwood Forests	0.0	0.0	541.0	541.0	0.0	381.0	381.0	0.0	295.0	295.0
Ecological Systems	45.0	66.0(11.0)	0.0	111.0(11.0)	111.0(11.0)	0.0	111.0(11.0)	111.0(11.0)	0.0	111.0(11.0)
Geological Systems	155.0	332.0	0.0	487.0	487.0	0.0	487.0	487.0	0.0	487.0
Lake Shorelines	-	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	1.0[2]	7.0	8.0	0.0[3]	8.0	8.0	0.0[3]	8.0	8.0
Scenic River Banks	-	18.0	-	18.0	18.0	-	18,0	18.0	-	18.0
Wilderness Areas	9.0	31.0(30.0)	0.0	40.0(30.0)	40.0(30.0)	0.0	40.0(30.0)	40.0(30.0)	0.0	40.0(30.0)
Total Land	209.0	449.0(41.0)	548.0	1,206.0(41.0)	657.0(41.0)	389.0	1,046.0(41.0)	657.0(41.0)	303.0	960.0(41.0)
Water Surface Area										
Lakes	5.0	11.0	-	16.0	16.0	-	16.0	16.0	-	16.0
Scenic Rivers	-	4.0	-	4.0	4.0	-	4.0	4.0	-	4.0
Total Water Surface	5.0	15.0	-	20.0	20.0	-	20.0	20.0	-	20.0
WRPA 3										
Land										
Bottomland Hardwood Forests	0.0	0.0	607.0	607.0	0.0	410.0	410.0	0.0	351.0	351.0
Lake Shorelines	-	1.0(1.0)	-	1.0(1.0)	1.0(1.0)	-	1.0(1.0)	1.0(1.0)	-	1.0
Open and Green Space (Urban)	-	31.0[2]	3.0	34.0	10.5[3]	23.5	34.0	0.0[3]	34.0	34.0
Scenic River Banks	3.0	25.0	-	28.0	28.0	-	28.0	28.0	-	28.0
Wetlands	11.0	53.0	0.0	64.0	64.0	0.0	64.0	64.0	0.0	64.0
Total Land	14.0	110.0(1.0)	610.0	734.0(1.0)	103.5(1.0)	433.5	537.0(1.0)	93.0(1.0)	385.0	478.0
Water Surface Area										
Lakes	33.0	1.0	-	34.0	34.0	-	34.0	34.0	-	34.0
Scenic Rivers	1.0	6.0	-	7.0	7.0	-	7.0	7.0	-	7.0
Total Water Surface	34.0	7.0	-	41.0	41.0	-	41.0	41.0	-	41.0

Table [illegible] - Environmental Quality Plan, Recommended Program, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Resource Feature	Resource Use (1,000 Acres)									
	1980				2000			2020		
	Primary Use[1] Established	Primary Use[1] New	Secondary Use	Total Use	Primary Use	Secondary Use	Total Use	Primary Use	Secondary Use	Total Use
WRPA 4										
Land										
Bottomland Hardwood Forests	0.0	0.0	930.0	930.0	0.0	930.0	930.0	0.0	930.0	930.0
Ecological Systems	0.0	9.9(9.9)	0.0	9.9(9.9)	9.9(9.9)	0.0	9.9(9.9)	9.9(9.9)	-	9.9(9.9)
Geological Systems	0.0	1.1(1.1)	0.0	1.1(1.1)	1.1(1.1)	0.0	1.1(1.1)	1.1(1.1)	0.0	1.1(1.1)
Lake Shorelines	0.0	2.0	-	2.0	2.0	-	2.0	2.0	-	2.0
Open and Green Space (Urban)	-	8.0[2]	-	8.0	2.6[2]	5.4	8.0	0.0[2]	8.0	8.0
Wilderness Areas	0.0	5.0(5.0)	0.0	5.0(5.0)	5.0(5.0)	0.0	5.0(5.0)	5.0(5.0)	0.0	5.0(5.0)
Total Land	0.0	26.0(16.0)	930.0	956.0(16.0)	20.6(16.0)	935.4	956.0(16.0)	18.0	938.0	956.0(16.0)
Water Surface Area										
Lakes	17.0	3.0	-	20.0	20.0	-	20.0	20.0	-	20.0
Scenic Rivers	-	-	-	-	-	-	-	-	-	-
Total Water Surface	17.0	3.0	-	20.0	20.0	-	20.0	20.0	-	20.0
WRPA 5										
Land										
Bottomland Hardwood Forests	0.0	0.0	2,208.4	2,208.4	0.0	2,186.4	2,186.4	0.0	2,095.4	2,095.4
Ecological Systems	15.0	5.0(5.0)	0.0	20.0(5.0)	20.0(5.0)	0.0	20.0(5.0)	20.0(5.0)	0.0	20.0(5.0)
Geological Systems	0.0	21.6(21.6)	0.0	21.6(21.6)	21.6(21.6)	0.0	21.6(21.6)	21.6(21.6)	0.0	21.6(21.6)
Lake Shorelines	-	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	13.0[2]	-	13.0	3.9[2]	9.1	13.0	0.0[2]	13.0	13.0
Scenic River Banks	14.0	14.0	-	28.0	28.0	-	28.0	28.0	-	28.0
Wilderness Areas	0.0	20.0(20.0)	0.0	20.0(20.0)	20.0(20.0)	0.0	20.0(20.0)	20.0(20.0)	0.0	20.0(20.0)
Total Land	29.0	74.6(46.6)	2,208.4	2,312.0(46.6)	94.5(46.6)	2,195.5	2,290.0(46.6)	90.6(46.6)	2,108.4	2,199,0(46.6)
Water Surface Area										
Lakes	33.0	1.0	-	34.0	34.0	-	34.0	34.0	-	34.0
Scenic Rivers	4.0	3.0	-	7.0	7.0	-	7.0	7.0	-	7.0
Total Water Surface	37.0	4.0	-	41.0	41.0	-	41.0	41.0	-	41.0
WRPA 6										
Land										
Bottomland Hardwood Forests	0.0	-	608.0	608.0	0.0	608.0	608.0	0.0	608.0	608.0
Lake Shorelines	-	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	2.0[2]	-	2.0	0.0[2]	2.0	2.0	0.0[2]	2.0	2.0
Total Land	0.0	3.0	608.0	611.0	1.0	610.0	611.0	1.0	610.0	611.0
Water Surface Area										
Lakes	8.0	1.0	-	9.0	9.0	-	9.0	9.0	---	9.0
Scenic Rivers	-	-	-	-	-	-	-	-	-	-
Total Water Surface	8.0	1.0	-	9.0	9.0	-	9.0	9.0	-	9.0

Table 148 - Environmental Quality Plan, Recommended Program, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Resource Feature	Resource Use (1,000 Acres) 1980 Primary Use 1/ Established	1980 Primary Use 1/ New	1980 Secondary Use	1980 Total Use	2000 Primary Use	2000 Secondary Use	2000 Total Use	2020 Primary Use	2020 Secondary Use	2020 Total Use
WRPA 7										
Land										
Bottomland Hardwood Forest	0.0	0.0	428.0	428.0	0.0	372.0	372.0	0.0	372.0	372.0
Ecological Systems	0.0	3.0(3.0)	0.0	3.0(3.0)	3.0(3.0)	0.0	3.0(3.0)	3.0(3.0)	0.0	3.0(3.0)
Geological Systems	0.0	1.0(1.0)	0.0	1.0(1.0)	1.0(1.0)	0.0	1.0(1.0)	1.0(1.0)	0.0	1.0(1.0)
Lake Shorelines	-	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	1.0 2/	-	1.0	0.0 2/	1.0	1.0	0.0 2/	1.0	1.0
Scenic River Banks	-	13.0	-	13.0	13.0	-	13.0	13.0	-	13.0
Wilderness Areas	0.0	27.0(27.0)	0.0	27.0(27.0)	27.0(27.0)	0.0	27.0(27.0)	27.0(27.0)	0.0	27.0(27.0)
Total Land	0.0	46.0(31.0)	428.0	474.0(31.0)	45.0(31.0)	373.0	418.0(31.0)	45.0(31.0)	373.0	418.0(31.0)
Water Surface Area										
Lakes	7.0	1.0	-	8.0	8.0	-	8.0	8.0	-	8.0
Scenic Rivers	-	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0
Total Water Surface	7.0	4.0	-	11.0	11.0	-	11.0	11.0	-	11.0
WRPA 8										
Land										
Botanical Systems	0.2	1.7(1.7)	0.0	1.9(1.7)	1.9(1.7)	0.0	1.9(1.7)	1.9(1.7)	0.0	1.9(1.7)
Bottomland Hardwood Forests	0.0	0.0	896.6	896.6	0.0	868.6	868.6	0.0	794.6	794.6
Geological Systems	-	202.5(2.5)	0.0	202.5(2.5)	202.5(2.5)	0.0	202.5(2.5)	202.5(2.5)	0.0	202.5(2.5)
Lake Shorelines	-	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0
Open and Green Space (Urban)	-	11.0 2/	1.0	12.0	2.4 2/	9.6	12.0	0.0 2/	12.0	12.0
Scenic River Banks	8.0	9.0	-	17.0	17.0	-	17.0	17.0	-	17.0
Total Land	8.2	225.2(4.2)	897.6	1,131.0(4.2)	224.8(14.2)	878.2	1,103.0(4.2)	222.4(4.2)	806.6	1,029.0
Water Surface Area										
Lakes	61.0	-	-	61.0	61.0	-	61.0	61.0	-	61.0
Scenic Rivers	2.0	2.0	-	4.0	4.0	-	4.0	4.0	-	4.0
Total Water Surface	63.0	2.0	-	65.0	65.0	-	65.0	65.0	-	65.0
WRPA 9										
Land										
Beaches and Shores	6.0	10.0	0.0	16.0	16.0	0.0	16.0	16.0	0.0	16.0
Botanical Systems	533.0	57.0(57.0)	0.0	59.0(57.0)	590.0(57.0)	0.0	590.0(57.0)	590.0(57.0)	0.0	590.0(57.0)
Bottomland Hardwood Forests	0.0	0.0	321.0	321.0	0.0	321.0	321.0	0.0	321.0	321.0
Geological Systems	0.0	5.6(5.6)	0.0	5.6(5.6)	5.6(5.6)	0.0	5.6(5.6)	5.6(5.6)	0.0	5.6(5.6)
Lake Shorelines	-	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0
Open and Green Space (Urban)	-	11.0 2/	1.0	12.0	0.0 2/	12.0	12.0	0.0 2/	12.0	12.0
Scenic River Banks	6.0	3.0	-	9.0	9.0	-	9.0	9.0	-	9.0
Wetlands	67.0	32.4	0.0	99.4	99.4	0.0	99.4	99.4	0.0	99.4
Wilderness Areas	0.0	102.0(102.0)	453.0	555.0(102.0)	102.0(102.0)	453.0	555.0(102.0)	102.0(102.0)	453.0	555.0(102.0)
Total Land	612.0	224.0	775.0	1,611.0(164.6)	825.0	786.0	1,611.0(164.6)	825.0	786.0	1,611.0(164.6)
Water Surface Area										
Lakes	110.0	-	-	110.0	110.0	-	110.0	110.0	-	110.0
Scenic Rivers	1.0	1.0	-	2.0	2.0	-	2.0	2.0	-	2.0
Total Water Surface	111.0	1.0	-	112.0	112.0	-	112.0	112.0	-	112.0

Table 148 - Environmental Quality Plan, Recommended Progra, Lower Mississippi Region (Cont'd)

Water Resources Planning Area and Resource Feature	Resource Use (1,000 Acres) 1980 Primary Use[1] Established	1980 Primary Use[1] New	1980 Secondary Use	1980 Total Use	2000 Primary Use	2000 Secondary Use	2000 Total Use	2020 Primary Use	2020 Secondary Use	2020 Total Use
WRPA 10										
Land										
Beaches and Shores	41.0	119.0	0.0	160.0	160.0	0.0	160.0	160.0	0.0	160.0
Botanical Systems	-	1.0(1.0)	-	1.0(1.0)	1.0(1.0)	-	1.0(1.0)	1.0(1.0)	-	1.0(1.0)
Bottomland Hardwood Forests	0.0	-	877.0	877.0	0.0	833.0	833.0	0.0	772.0	772.0
Lake Shorelines	-	4.0	-	4.0	4.0	-	4.0	4.0	-	4.0
Open and Green Space (Urban)	-	30.0[2]	1.0	31.0	8.0[3]	23.0	31.0	0.0[3]	31.0	31.0
Scenic River Banks	4.0	-	-	4.0	4.0	-	4.0	4.0	-	4.0
Total Land	45.0	154.0	878.0	1,077.0	177.0(1.0)	856.0	1,033.0	169.0(1.0)	803.0	972.0
Water Surface Area										
Lakes	124.0	-	-	124.0	124.0	-	124.0	124.0	-	124.0
Scenic Rivers	1.0	-	-	1.0	1.0	-	1.0	1.0	-	1.0
Total Water Surface	125.0	-	-	125.0	125.0	-	125.0	125.0	-	125.0
WRPA'S 1 through 10										
Land										
Beaches and shores	47.0	129.0	0.0	176.0	176.0	0.0	176.0	176.0	0.0	176.0
Botanical Systems	533.2	59.7(59.7)	0.0	592.9(59.7)	592.9(59.7)	0.0	592.9(59.7)	592.9(59.7)	0.0	592.9(59.7)
Bottomland Hardwood Forests	0.0	0.0	8290.0	8290.0	0.0	7783.0	7783.0	0.0	7412.0	7412.0
Ecological Systems	60.0	83.9(28.9)	0.0	143.9(28.9)	143.9(28.9)	0.0	143.9(28.9)	143.9(28.9)	0.0	143.9(28.9)
Geological Systems	155.0	563.8(31.8)	0.0	718.8(31.8)	718.8(31.8)	0.0	718.8(31.8)	718.8(31.8)	0.0	718.8(31.8)
Lake Shorelines	-	21.0(1.0)	-	21.0(1.0)	21.0(1.0)	-	21.0(1.0)	21.0(1.0)	-	21.0(1.0)
Open and Green Space (Urban)	-	108.0	13.0	121.0	27.4[3]	93.6	121.0	0.0[3]	121.0	121.0
Scenic River Banks	35.0	82.0	-	117.0	117.0	-	117.0	117.0	-	117.0
Wetlands	78.0	85.4	0.0	163.4	163.4	0.0	163.4	163.4	0.0	163.4
Wilderness Areas	9.0	185.0(184.0)	453.0	647.0(184.0)	194.0(184.0)	453.0	647.0(184.0)	194.0(184.0)	453.0	647.0(184.0)
Total Land	917.2	1317.8(305.4)	8756.0	10,991.0(305.4)	2154.4(305.4)	8329.6	10,484.0(305.4)	2127.0(305.4)	7896.0	10,113.0(305.4)
Water Surface Area										
Lakes	384.0	22.0	-	406.0	406.0	-	406.0	406.0	-	406.0
Scenic Rivers	9.0	19.0	-	28.0	28.0	-	28.0	28.0	-	28.0
Total Water Surface	393.0	41.0	-	434.0	434.0	-	434.0	434.0	-	434.0

1/ Public investment required for new use between 1970 and 1980; operation and maintenance required thereafter. Established use consists of acreages expected to remain in their present condition. Acreages designated for exclusive use are given in parentheses.
2/ Land multi-use for environmental quality purposes and Class A recreation purposes. Public investment allocated to both purposes.
3/ Primary use shifts with the development of open and green space for recreation purposes.

Table 149 - Listing of Recommended Plans for Problem Amelioriation, Lower Mississippi Region

Plan	Location in Report: Table No.	Page No.
Flood Control		
Structural	106	277
Nonstructural	107	281
Sediment and Erosion	111	287
Land Drainage	113	291
Water Quality Control	115	294
Navigation	116	299
Hydropower	118	303

of diversion works are extremely high, particularly when land cuts over long distances are involved. Because of these high costs, and because other higher priority needs for water, such as municipal and industrial water supply and navigation, preclude the diversion of water from the Mississippi River except in certain reaches and in less than desired quantities, only measures involving the transfer of available water to strategic areas in proximity to the Mississippi River or its distributary, the Atchafalaya River, are included in the plan. An additional constraint dictated by these conditions requires the land-building needs occurring in WRPA 9 be offset as much as possible by diversions to areas in WRPA 10, located near the Mississippi River below New Orleans.

The coastal and estuarine plan is outlined in table 150. Measures in the 1980 time frame include 10.1 miles of bank stabilization works for control of shoreline erosion and one salinity control structure, 10 miles of levee, and 5 miles of channel work for salinity alteration and land-building in WRPA 10. Measures scheduled for addition to the plan in 2000 include water saving devices; such as, 10 low flow weirs for water level management and land-building in the Atchafalaya Basin in WRPA 9, and three additional control structures, 50 miles of levee, and 25 miles of channel to add to the previous works for salinity control and land-building in Plaquemines Parish, Louisiana, WRPA 10. Measures to be added to the plan by the year 2020 include construction of five additional control structures; one navigation lock; one spillway gate modification; 42 miles of channel; and 70 miles of levee. These measures would satisfy additional needs for salinity control and land-building in WRPA's 9 and 10. The plan calls for a total diversion of nearly 271,000 c.f.s. (approximately 175,000 m.g.d.) of Mississippi River flow, while all other higher priority needs are simultaneously satisfied.

Table 150 - Plan for Coastal and Estuarine Zone - All Programs, Lower Mississippi Region

WRPA	DESCRIPTION: LOCATION	PURPOSE [1/]	MEASURES	QUANTITY OF NEED [2/] SATISFIED
1980				
8&9	-	-	-	-
10	Gr. Isle, Gr. Terre Isle Rigoletts & Lk. Pontchratrain (2 Locations)	EP	10.1 mi. of bk. stab. works	10.1 mi.
	E. of Miss.R., vic. of Bohemia,La.	SC&LB	1 contr. struc., 10 mi.lev. & 5 mi.ch.	1,500 c.f.s. [3/]
Region Total				10 mi. & 1,500 c.f.s.
2000				
8	-	-	-	-
9	Atchafalaya Basin	WLM&LB	10 low flow weirs	89,800 c.f.s.
10	Myrtle Grove & Homeplace - w. of Miss. R. & Scarsdale - e. of Miss. R.	SC&LB	3 contr. struc., 5- mi. lev. & 25 mi. ch.	6,800 c.f.s.
Region Total				96,600 c.f.s.
2020				
8	-	-	-	-
9	Lower Calcasieu Lake	SC	1 contr. struc. & nav. lock	13,800 c. f. s. [4/]
10	Bonnet Carre to Lakes Pontchartrain & Borgne	SC&LB	7 mi. ch. & spillway gates modif.	17,700 c.f.s.
	E of Miss. R. below Bohemia- 3 sites	LB LB	3 contr. struc., 30 mi.lev. & 15 mi.ch.	66,400 c.f.s.
	W. of Miss. R. below Triumph,La. 4 sites	LB&SC	1 contr. struc. 40 mi. lev. & 20 mi. ch.	88,500 c.f.s. [5/]
Region Total				186,400 c.f.s.

1/ EP - Erosion Protection, SC - Salinity Control, LB - Land Building, WLM - Water Level Management.
2/ Unsatisfied - 2,400 c.f.s. for water level management, and 274,300 c.f.s. for land building.
3/ All needs for salinity alteration, land building, and water level management are expressed in terms of Mississippi River Flow, as explained in Appendix 0, Coastal and Estuarine.
4/ The structural measures will obviate the need for diverting this flow.
5/ Also provides 17,300 c.f.s. for salinity control.

By the year 2020, the plan satisfies all of the need for salinity control, 97 percent of the need for water level management, and 50 percent of the requirement for land-building. The diversion of 43,300 c.f.s.[1/] for salinity control and 89,800 c.f.s. for water level management would also serve to meet a part (133,100 c.f.s.) of the flow required for land-building, and an additional 137,600 c.f.s. would be provided for this purpose. No practical alternatives exist to obtain the quantities of water required to meet the remaining needs (274,300 c.f.s. for land-building and 2,400 c.f.s. for water level management).

In the plan, the diversion of Mississippi River flows for enhancing the productivity of the estuarine zone is precluded during periods of extreme low flow. Points of diversion are located far enough upstream of the Head of Passes to be immune to the effects of river enlargement work currently proposed for that area.

Archeology and History

The recommended program seeks not only the well-being of future generations, but also the commemoration of ages past. The legacy includes thousands of archeological and historical sites, some well preserved, some in disrepair, others yet unknown. Needs have been expressed for intensive short-term archeological surveys of the entire region, for testing almost 2,000 sites, and for excavating about one out of every four sites tested. Needs have likewise been expressed for registering, marking, and restoring several thousand historic structures, and for marking and maintaining historic sites, roads and trails, and cemeteries. Repletion will require positive actions by both public and private interests. Plans for satisfying all the identified needs for preserving, restoring, and maintaining the archeological and historical resources are summarized in table 151.

The archeological portion of the plan calls for surveys blanketing the region by the year 1980, with sites threatened by development activities receiving first priority. It also calls for testing and excavating 426 and 97 sites, respectively, by the year 1980. Between the years 1980 and 2000, the plan requires the excavation of an additional 328 sites out of 1,422 sites to be tested. Site testing and excavation work required beyond the year 2000 cannot be predicted without the results of the short-term surveys. Hence, the scope of the extremely long-range site work is not specified in the plan.

Included in the historical portion of the plan are 9,354 structures, all of which should be added to the National or State register of Historic Places, and most of which will require some amount of restorative work by the year 2020. Also included are 125 and 1,216 historic districts and sites, respectively, which should be added to the register.

1/ The need for an additional 13,800 c.f.s. for salinity control in WRPA 9 would be met through structural improvements, without effecting an actual transfer of water.

Table 151 - Recommended Plan for Preservation, Restoration and Maintenance of Archeological and Historical Resources, Lower Mississippi Region

WRPA	Time Frame	Archeologic Resources: Surveys	Archeologic Resources: Testing	Archeologic Resources: Excavation	Historic Resources: Registration of Historic Places 1/: Structures	Historic Resources: Registration of Historic Places 1/: Districts	Historic Resources: Registration of Historic Places 1/: Sites	Historic Resources: Restoration of Structures	Historic Resources: Maintenance of Roads and Trails	Historic Resources: Maintenance of Cemeteries	Historic Resources: Erection of Interpretive Markers
2	1970-1980	8	74	18	140	3	102	35	8	1	35
	1980-2000	0	248	58	270	4	122	90	7	1	50
	2000-2020	0	-	-	345	3	142	115	6	2	50
	Total	8	322	76	755	10	366	140	21	3	135
3	1970-1980	5	45	10	1,115	9	80	45	3	45	82
	1980-2000	0	156	35	403	11	33	70	16	65	145
	2000-2020	0	-	-	722	16	27	90	4	58	152
	Total	5	201	45	2,240	36	140	205	23	168	379
4	1970-1980	6	61	14	35	2	50	12	4	20	10
	1980-2000	0	200	44	100	2	12	45	2	75	50
	2000-2020	0	-	-	220	1	2	100	0	20	150
	Total	6	261	58	355	5	64	157	6	115	210
5	1970-1980	10	90	21	150	4	151	75	3	0	80
	1980-2000	0	300	69	250	2	174	131	3	2	190
	2000-2020	0	-	-	325	2	152	154	4	0	300
	Total	10	390	90	725	8	474	360	10	2	570
6	1970-1980	2	20	4	38	1	11	21	0	0	34
	1980-2000	0	61	14	51	1	16	10	1	1	124
	2000-2020	0	-	-	32	0	26	15	2	1	204
	Total	2	81	18	121	2	53	46	3	2	362
7	1970-1980	4	28	6	100	4	50	20	5	50	25
	1980-2000	0	92	21	100	10	20	10	7	75	50
	2000-2020	0	-	-	100	25	15	15	10	90	75
	Total	4	120	27	300	39	85	45	22	150	215
8	1970-1980	3	27	6	55	2	8	28	3	6	35
	1980-2000	0	94	22	110	4	19	56	4	13	140
	2000-2020	0	0	-	88	6	5	58	3	12	235
	Total	3	121	28	253	12	32	142	10	31	410
9	1970-1980	6	54	12	70	2	0	15	0	2	30
	1980-2000	0	180	42	100	4	0	32	2	2	130
	2000-2020	0	0	-	200	2	0	23	1	0	230
	Total	6	234	54	370	8	0	70	3	4	390
10	1970-1980	3	27	6	300	1	2	268	0	1	36
	1980-2000	0	91	23	2,900	2	0	2,730	2	2	156
	2000-2020	0	-	-	1,075	2	0	4,200	1	0	276
	Total	3	118	29	4,275	5	2	7,198	3	3	468
LMR	1970-1980	48	426	97	2,003	28	454	519	26	125	367
	1980-2000	0	1,422	328	4,284	40	396	3,174	44	236	1,035
	2000-2020	0	-	-	3,107	57	369	4,770	31	183	1,672
	Total	48	1,848	425	9,394	125	1,219	8,463	101	544	3,074

1/ National or State Register of Historic Places.

Interpretive markers will be required at many of these places. They will also be required at some of the 101 roads and trails and the 478 cemeteries that would be protected and maintained as part of the plan.

Health Aspects

As discussed in Appendix M, the improvement of the human health environment in the Lower Mississippi Region is dependent upon actions by State Health Agencies in Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee. Recommended actions for satisfying the identified health aspects needs are:

1. Improvement of the epidemiology programs of the State Departments of Health through the development of consistent local contracts and increased emphasis on water and vector-borne diseases.

2. Expansion of water supply programs for the State Departments of Health to provide essential surveillance and technical assistance to all water systems in the region. Recommended levels of expansion are summarized in table 152.

3. Improvement of measures for protecting drinking water supplies that are subject to contamination from municipal, industrial, and agricultural waste discharges.

4. Planning in Arkansas, Louisiana, and Mississippi directed to assistance and action for protecting water supply systems in the event of natural disasters.

5. Revision of water quality criteria for certain recreation waters in Arkansas, Kentucky, Louisiana, Mississippi, and Tennessee. Revision should apply to all cases where water-contact recreation is a primary use of the water resource, and should be based on the fecal coliform parameter as recommended in NTAC Water Quality Criteria.

6. Development of comprehensive State programs to protect the health of water-contact recreationists. Such programs should include systematic water quality monitoring and enforcement powers at the State level to restrict public usage of unsafe waters.

7. Improvement of vector control programs at the State level to direct disease vector surveillance in Arkansas, Kentucky, Louisiana, and Missouri.

8. Revision of enabling legislation in Mississippi and Tennessee to permit the establishment and operation of vector abatement districts in those States.

9. Establishment of 50 vector abatement districts in the region by 1980, with the establishment of an additional 17 districts by the

year 2020. These districts are needed in Arkansas, Tennessee, Mississippi, and Louisiana; none are needed in the Kentucky, Missouri, or Illinois portions of the region. Recommended vector abatement districts are summarized in table 153.

Table 152 - Recommended Expansion of Water Supply Programs, Lower Mississippi Region

State Department of Health	1980		2000		2020	
	Staff1/	Budget ($1,000)	Staff1/	Budget ($1,000)	Staff1/	Budget ($1,000)
Arkansas2/	4	300	8	600	16	1,200
Kentucky3/	5	400	10	800	20	1,600
Louisiana4/	4	300	8	600	16	1,200
Mississippi5/	4	300	8	600	16	1,200
Missouri6/	3	500	6	1,000	12	2,000
Tennessee7/	5	400	10	800	20	1,600

1/ Multiple of staff level existing in 1970.
2/ Includes about 16 percent of WRPA 1, 70 percent of WRPA 2, 63 percent of WRPA 5, and 26 percent of WRPA 6.
3/ Includes about 3 percent of WRPA 1 and 11 percent of WRPA 3.
4/ Includes about 45 percent of WRPA 1, 37 percent of WRPA 5, 74 percent of WRPA 6, 81 percent of WRPA 8, all of WRPA 9, and all of WRPA 10.
5/ Includes about 22 percent of WRPA 1, 11 percent of WRPA 3, all of WRPA 4, all of WRPA 7, and 19 percent of WRPA 8.
6/ Includes about 5 percent of WRPA 1 and 30 percent of WRPA 2.
7/ Includes about 8 percent of WRPA 1 and 78 percent of WRPA 3.

Table 153 - Recommended Establishment of Vector Abatement Districts, Lower Mississippi Region

State and Planning Area	Number of Vector Abatement Districts 1980	2000	2020	Total
Arkansas				
WRPA 1	5	2	2	9
WRPA 5	4	3	0	7
Total	9	5	2	16
Louisiana				
WRPA 5	0	0	2	2
WRPA 6	6	0	0	6
WRPA 8	6	0	0	6
WRPA 9	13	0	0	13
WRPA 10	5	0	0	5
Total	30	0	2	32
Mississippi				
WRPA 4	10	3	3	16
Tennessee				
WRPA 3	1	1	1	3
Region				
WRPA 1	5	2	2	9
WRPA 3	1	1	1	3
WRPA 4	10	3	3	16
WRPA 5	4	3	2	9
WRPA 6	6	0	0	6
WRPA 8	6	0	0	6
WRPA 9	13	0	0	13
WRPA 10	5	0	0	5
	50	9	8	67

Summary of Recommended Program

The Recommended Framework Program comprising component plans from the National Income and Environmental Quality Program is summarized in table 154. The land-use component of the program is scaled under assumed conditions of continued water and related land resources development. This means that the flood control, sediment and erosion control, land treatment and manangement, and drainage components are essential program ingredients for meeting future requirements, not only for food and fiber production, but also for fish and wildlife, environmental quality, and other purposes.

Program Costs

Estimated costs for the Recommended Program are summarized in table 155. The estimates are in terms of January 1972 dollars, without adjustment or discounting by time periods. The allocation of costs between Federal and non-Federal interests is in accordance with the percentages used for the alternate programs (table 122). Similarly, certain flood control features of the ongoing Mississippi River and Tributaries Project are included in the costs, as in the case of the alternate program.

The total public investment cost of the Recommended Program is estimated at $14.8 billion, of which $7.4 billion is Federal cost and $7.4 billion is non-Federal. Average annual operation and maintenance costs are estimated at $329 million.

Table 154 - Recommended Program Composition, Lower Mississippi Region

Planning Area & Time Frame	Water Supply (mgd)			Water Surface Area			Land (1,000 Acres)			
	Municipal	Fish & Wildlife	Total	Recreation (1,000 Acres)	Fish & Wildlife (Miles)[1]	Natural Environment (1,000 Acres)	Recreation[4]	Fish & Wildlife	Natural Environment[5]	Total
WRPA 1										
1970-1980	0.0	0.0	0.0	0.0	[3]	4.0	0.0	0.0	6.0	6.0
1980-2000	0.0	0.0	0.0	0.0	[3]	0.0	0.0	0.0	0.0	0.0
2000-2020	0.0	0.0	0.0	0.0	[3]	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	[3]	4.0	0.0	0.0	6.0	6.0
WRPA 2										
1970-1980	5.3	50.0	186.5[2]	0.0	1203.0	15.0	2.0	104.0	448.0	554.0
1980-2000	16.5	110.0	153.3[2]	3.0	0.0	0.0	1.4	63.6	0.0	65.0
2000-2020	26.0	110.0	136.0[2]	45.0	0.0	0.0	9.6	90.7	0.0	100.3
Total	47.8	270.0	475.8[2]	48.0	1203.0	15.0	13.0	258.3	448.0	719.3
WRPA 3										
1970-1980	33.9	43.0	76.9	139.0	822.0	7.0	30.0	56.2	106.7[6]	192.9
1980-2000	102.4	86.0	188.4	185.0	0.0	0.0	28.1	38.1	0.0	66.2
2000-2020	130.7	86.0	216.7	173.0	0.0	0.0	43.3	54.3	0.0	97.6
Total	267.0	215.0	482.0	497.0	822.0	7.0	101.4	148.6	106.7	356.7
WRPA 4										
1970-1980	11.9	22.0	33.9	8.0	1100.0	3.0	7.3	92.2	25.4	124.9
1980-2000	24.1	30.0	54.1	67.0	0.0	0.0	9.8	43.0	0.0	52.8
2000-2020	33.9	34.0	67.9	38.0	0.0	0.0	20.2	61.3	0.0	81.5
Total	69.9	86.0	155.9	113.0	1100.0	3.0	37.3	196.5	25.4	259.2
WRPA 5										
1970-1980	11.6	31.0	42.6	0.0	1931.0	4.0	9.5	103.5	73.6[6]	186.6
1980-2000	23.9	60.0	83.9	0.0	0.0	0.0	15.7	60.4	0.0	76.1
2000-2020	44.0	62.0	106.0	60.0	0.0	0.0	27.4	86.2	0.0	113.6
Total	79.5	153.0	232.5	60.0	1931.0	4.0	52.6	250.1	73.6	376.3
WRPA 6										
1970-1980	1.0	8.0	9.0	0.0	536.0	1.0	3.7	25.0	2.9[6]	31.6
1980-2000	2.3	16.0	18.3	2.0	0.0	0.0	1.3	11.7	0.0	13.0
2000-2020	3.3	17.0	20.3	10.0	0.0	0.0	2.0	16.7	0.0	18.7
Total	6.6	41.0	47.6	12.0	536.0	1.0	7.0	53.4	2.9	63.3
WRPA 7										
1970-1980	3.3	2.0	5.3	0.0	450.0	4.0	3.2	30.0	45.9[6]	79.1
1980-2000	6.8	6.0	12.8	0.0	0.0	0.0	1.9	17.4	0.0	19.3
2000-2020	10.7	5.0	15.7	0.0	0.0	0.0	3.0	24.7	0.0	27.7
Total	20.8	13.0	33.8	0.0	450.0	4.0	8.1	72.1	45.9	126.1
WRPA 8										
1970-1980	16.9	2.0	18.9	0.0	400.0	2.0	14.7	14.0	222.2[6]	250.9
1980-2000	36.5	3.0	39.5	0.0	0.0	0.0	10.1	3.2	0.0	13.3
2000-2020	48.9	4.0	52.9	36.0	0.0	0.0	15.8	4.5	0.0	20.3
Total	102.3	9.0	111.3	36.0	400.0	2.0	40.6	21.7	222.2	284.5
WRPA 9										
1970-1980	20.0	73.0	93.0	0.0	928.0	1.0	17.6	27.0	219.3[6]	263.9
1980-2000	34.2	188.0	424.2[2]	0.0	0.0	0.0	8.8	119.7	0.0	128.5
2000-2020	41.5	120.0	425.5[2]	0.0	0.0	0.0	12.4	170.8	0.0	183.2
Total	95.7	381.0	942.7[2]	0.0	928.0	1.0	38.8	317.5	219.3	575.6
WRPA 10										
1970-1980	35.6	0.0	35.6	0.0	329.0	0.0	37.5	11.0	143.0[6]	191.5
1980-2000	89.8	2.0	91.8	0.0	0.0	0.0	23.9	32.8	0.0	56.7
2000-2020	118.1	1.0	119.1	0.0	0.0	0.0	37.0	46.7	0.0	83.7
Total	243.5	3.0	247.0	0.0	329.0	0.0	98.4	90.5	143.0	331.9
Region										
1970-1980	139.5	231.0	501.7[2]	147.0	7699.0	41.0	125.5	463.9	1293.0	1882.4
1980-2000	336.5	501.0	1066.3[2]	257.0	0.0	0.0	101.0	389.9	0.0	490.9
2000-2020	457.1	439.0	1160.1[2]	362.0	0.0	0.0	170.7	561.9	0.0	732.6
Total	933.1	1171.0	2728.1[2]	766.0	7699.0	41.0	397.2	1415.7	1293.0	3105.9

1/ Stream miles.
2/ Includes irrigation withdrawals.
3/ The main stem of the Mississippi River is not considered quality stream fishing in the fish and wildlife context involved here. However, access is provided (though no mileage is given) and costs are included in the program (shared equally by recreation) for this access which will make the Mississippi River available to residents of adjoining WRPA's for limited fishing and recreation activities.
4/ Overlaps Natural Environmental Quality acreage in some WRPA's. Double counting has been eliminated in cost tables.
5/ Excludes urban open and green space provided through the acquisition of Class A recreation lands in 1970-1980 time frame.
6/ Provides all or part of Class A recreation lands for 2000 and 2020.

Table 154 - Recommended Program Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Flood Control									
	Principal Reaches					Upstream Watersheds				
			Reservoirs							
	Levees (Miles)	Channels (Miles)	Number	Storage (1000 Acre-Ft.)	Pumping Plants (Number)	Channels (Miles)	Number	Storage (1000 Acre-Ft.)	Floodplain Management (1000 Acres)	Watershed Management (1000 Acres)
WRPA 1										
1970-1980	0	0	0	0	0	0	0	0	0	0
1980-2000	0	0	0	0	0	0	0	0	0	0
2000-2020	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
WRPA 2										
1970-1980	5.9	641.6	0	0	5	4,878	268	149	2,236	8,034
1980-2000	9.7	618.0	0	0	3	130	0	0	87	291
2000-2020	0	340.0	0	0	0	95	5	11	92	411
Total	15.6	1599.6	0	0	8	5,103	273	160	2,415	8,736
WRPA 3										
1970-1980	7.7	292.0	1	18	7	660	201	244	293	1,929
1980-2000	169.2	51.7	0	0	2	454	120	134	111	918
2000-2020	0	96.9	0	0	0	269	92	99	115	668
Total	176.9	440.6	1	18	9	1,383	413	477	519	3,515
WRPA 4										
1970-1980	359.4	928.3	0	0	1	3,674	53	42	1,370	4,737
1980-2000	76.6	208.1	0	0	9	18	16	18	24	131
2000-2020	82.5	605.0	0	0	9	1,146	12	11	305	970
Total	518.5	1741.4	0	0	19	4,838	81	71	1,699	5,838
WRPA 5										
1970-1980	152.9	69.0	11	450	3	389	116	209	664	1,730
1980-2000	188.7	242.9	1	80	6	146	2	15	87	162
2000-2020	2.0	62.0	0	0	1	301	50	101	504	1,283
Total	343.6	373.9	12	530	10	836	168	325	1,255	3,175
WRPA 6										
1970-1980	0	266.7	0	0	1	2,026	0	0	1,465	1,876
1980-2000	1.5	159.6	0	0	1	325	0	0	111	317
2000-2020	0	105.0	0	0	0	0	0	0	0	0
Total	1.5	531.3	0	0	2	2,351	0	0	1,576	2,193
WRPA 7										
1970-1980	12.4	12.0	0	0	1	1,157	284	423	348	2,690
1980-2000	7.0	0	0	0	2	163	94	142	60	1,018
2000-2020	6.0	0	0	0	0	0	0	0	0	0
Total	25.4	12.0	0	0	3	1,320	378	565	408	3,708
WRPA 8										
1970-1980	0	6.0	0	0	0	983	55	104	734	1,505
1980-2000	0	3.0	0	0	0	368	98	169	219	1,225
2000-2020	10.5	3.0	0	0	2	0	12	37	17	443
Total	10.5	12.0	0	0	2	1,351	165	310	970	3,173
WRPA 9										
1970-1980	13.5	163.0	0	0	0	2,875	0	0	1,810	3,025
1980-2000	13.9	0	0	0	0	511	0	0	469	797
2000-2020	62.0	163.0	0	0	0	0	0	0	2,279	0
Total	89.4	163.0	0	0	0	3,386	0	0	2,279	3,822
WRPA 10										
1970-1980	20.0	0	0	0	5	505	0	0	337	669
1980-2000	61.6	0	0	0	17	344	3	13	335	530
2000-2020	44.0	0	0	0	3	40	0	0	42	42
Total	125.6	0	0	0	25	889	3	13	714	1,241
Region										
1970-1980	571.8	2378.6	12	468	22	17,147	977	1,171	9,258	26,196
1980-2000	528.2	1283.3	1	80	40	2,459	333	491	1,502	5,389
2000-2020	207.0	1211.9	0	0	15	1,851	171	259	1,074	3,819
Total	1307.0	4873.8	13	548	77	21,457	1,481	1,921	11,834	35,404

Table 154 - Recommended Program Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Land Treatment[7] (1000 Acres)	Sediment and Erosion Control: Streambanks (Miles)	Sediment and Erosion Control: Roadbanks (Miles)	Sediment and Erosion Control: Total (Miles)	Drainage: Watershed Management (1000 Acres)	Drainage: Channels (Miles)	Municipal Water Quality Control: Secondary Treatment (1000 lb. BOD_5)	Municipal Water Quality Control: Advance Treatment (1000 lb. BOD_5)	Municipal Water Quality Control: Other[8] (1000 lb. BOD_5)	Municipal Water Quality Control: Bacteria Control[9] (mgd)
WRPA 1										
1970-1980	0	0	0	0	0	0	0	0	0	0
1980-2000	0	0	0	0	0	0	0	0	0	0
2000-2020	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
WRPA 2										
1970-1980	3256.5	128	441	569	474.3	4930.0	14.0	0	5.0	39.9
1980-2000	3597.6	49	386	435	948.4	5080.0	0	38.0	1.0	16.6
2000-2020	4023.7	36	275	311	948.5	5120.0	0	69.0	2.0	26.3
Total	10,877.8	213	1102	1315	2371.2	15,130.0	-	-	-	82.8
WRPA 3										
1970-1980	2512.3	369	554	923	16.1	140.0	140.0	0	19.0	113.8
1980-2000	2613.5	222	485	707	32.2	240.0	0	249.0	0	75.7
2000-2020	2726.8	152	346	498	32.3	230.0	0	362.0	7.0	91.4
Total	7852.6	743	1385	2128	80.6	610.0	-	-	-	280.9
WRPA 4										
1970-1980	3354.1	266	806	1072	294.9	4040.0	25.0	0	5.0	45.6
1980-2000	3697.5	191	705	896	589.8	3130.0	0	47.0	1.0	17.8
2000-2020	3838.5	143	503	646	589.8	3100.0	0	72.0	2.0	25.4
Total	10,890.1	600	2014	2614	1474.5	10,270.0	-	-		88.8
WRPA 5										
1970-1980	3385.8	76	1174	1250	114.6	910.0	26.0	0	7.0	24.8
1980-2000	3612.0	50	1028	1078	229.1	1310.0	0	60.0	2.0	14.3
2000-2020	4073.3	35	734	769	229.1	1370.0	0	98.0	2.0	24.9
Total	11,071.1	161	2936	3097	572.8	3590.0	-	-	-	64.0
WRPA 6										
1970-1980	1259.3	42	165	207	131.7	1460.0	6.0	0	2.0	2.1
1980-2000	1410.2	37	145	182	263.4	1560.0	0	9.0	1.0	1.2
2000-2020	1530.2	28	103	131	263.4	1350.0	0	12.0	1.0	1.7
Total	4199.7	107	413	520	658.5	4370.0	-	-	-	5.0
WRPA 7										
1970-1980	1261.9	106	524	630	21.4	410.0	5.0	0	1.0	6.1
1980-2000	1236.1	67	458	525	42.8	250.0	0	9.0	0	2.8
2000-2020	1406.4	44	327	371	42.8	230.0	0	13.0	1.0	4.4
Total	3904.4	217	1309	1526	107.0	890.0	-	-	-	13.3
WRPA 8										
1970-1980	851.9	40	232	272	20.8	540.0	29.0	0	6.0	20.4
1980-2000	798.7	24	203	227	41.6	390.0	0	59.0	2.0	23.9
2000-2020	871.5	16	145	161	41.6	230.0	0	89.0	3.0	32.0
Total	2522.1	80	580	660	104.0	1160.0	-	-	-	76.3
WRPA 9										
1970-1980	1857.9	8	599	1079	196.8	2210.0	40.0	0	10.0	32.4
1980-2000	2091.5	3	524	811	393.5	2240.0	0	72.0	3.0	29.2
2000-2020	2213.6	4	374	566	393.6	2000.0	0	100.0	4.0	37.4
Total	6163.0	15	1497	2456	983.9	6450.0	-	-	-	99.0
WRPA 10										
1970-1980	670.0	2	38	40	25.8	430.0	190.0	0	21.0	74.1
1980-2000	631.1	1	33	34	51.7	420.0	0	204.0	6.0	63.9
2000-2020	544.0	1	23	24	51.6	290.0	0	297.0	8.0	77.3
Total	1845.1	4	94	98	129.1	1140.0	-	-	-	215.3
Region										
1970-1980	18,409.7	1,037	4533	5570	1296.4	15,070.0	394.0	0	76.0	359.2
1980-2000	19,688.2	644	3967	4611	2592.5	14,620.0	0	747.0	21.0	245.4
2000-2020	21,228.0	459	2830	3289	2592.7	13,920.0	0	1112.0	30.0	320.8
Total	59,325.9	2,140	11,330	13,470	6481.6	43,610.0	-	-	-	925.4

7/ Includes land treatment to reduce flood runoff and critical area treatment to reduce sediment and erosion.
8/ Includes mechanical reaeration and stream assimilation.
9/ Chlorination.

Table 154 - Recommended Program Composition, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Navigation Facilities: Channels (Miles) Deep Draft	Shallow Draft	Total	Harbors (Number)	Locks (Number)	Hydropower Production (MW)	Coastal & Estuarine	Archeological & Historical	Public Health
WRPA 1									
1970-1980	288.0	0	288.0	0	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	.0	0	0	0	0	9/	10/
Total	288.0	0	288.0	0	0	0	0	9/	10/
WRPA 2									
1970-1980	0	200.0	200.0	2	0	7.5	0	9/	10/
1980-2000	0	0	0	6	0	70.6	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	200.0	200.0	9	0	78.1	0	9/	10/
WRPA 3									
1970-1980	0	0	0	1	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	2	0	0	0	9/	10/
WRPA 4									
1970-1980	0	0	0	7	1	18.0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	10	1	18.0	0	9/	10/
WRPA 5									
1970-1980	0	0	0	5	2	40.0	0	9/	10/
1980-2000	0	0	0	2	0	50.0	0	9/	10/
2000-2020	0	0	0	2	0	0	0	9/	10/
Total	0	0	0	9	2	90.0	0	9/	10/
WRPA 6									
1970-1980	0	0	0	3	0	0	0	9/	10/
1980-2000	0	0	0	0	0	0	0	9/	10/
2000-2020	0	0	0	1	0	0	0	9/	10/
Total	0	0	0	4	0	0	0	9/	10/
WRPA 7									
1970-1980	0	0	0	0	0	0	0	9/	10/
1980-2000	0	0	0	1	0	0	0	9/	10/
2000-2020	0	0	0	0	0	0	0	9/	10/
Total	0	0	0	1	0	0	0	9/	10/
WRPA 8									
1970-1980	0	0	0	0	0	0	11/	9/	10/
1980-2000	0	0	0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	1	0	11/	9/	10/
Total	0	0	0	0	3	0	11/	9/	10/
WRPA 9									
1970-1980	6.5	84.0	90.5	0	2	0	11/	9/	10/
1980-2000	34.0	270.0	304.0	0	2	0	11/	9/	10/
2000-2020	200.0	0	200.0	0	0	0	11/	9/	10/
Total	240.5	354.0	594.5	0	4	0	11/	9/	10/
WRPA 10									
1970-1980	50.0	97.0	147.0	0	1	0	11/	9/	10/
1980-2000	0	188.0	188.0	0	2	0	11/	9/	10/
2000-2020	0	0	0	0	3	0	11/	9/	10/
Total	50.0	285.0	335.0	0	6	0	11/	9/	10/
Region									
1970-1980	344.5	381.0	725.5	18	6	65.5	11/	9/	10/
1980-2000	34.0	458.0	492.0	11	6	120.6	11/	9/	10/
2000-2020	200.0	0	200.0	6	4	0	11/	9/	10/
Total	578.5	839.0	1417.5	35	16	186.1	11/	9/	10/

9/ Composed of surveying, testing and excavating archeological sites, and preservation, restoration and maintenance of historic resources.
10/ Composed of public drinking water programs and vector abatement districts at state level.
11/ Composed of measures for salinity control, shoreline erosion control, and water level management.

Table 155 - Estimated Program Costs, Recommended Program, Lower Mississippi Region

Planning Area & Time Frame	Investment ($1,000)								
	Federal			Non-Federal			Total		
	Natural Environment 1/	Other 2/	Subtotal	Natural Environment 1/	Other 2/	Subtotal	Natural Environment 1/	Other 2/	Total
WRPA 1									
1970-1980	749	27,111	27,860	748	9,111	9,859	1,497	36,222	37,719
1980-2000	0	809	809	0	809	809	0	1,618	1,618
2000-2020	0	0	0	0	0	0	0	0	0
Total	749	27,920	28,669	748	9,920	10,668	1,497	37,840	39,337
WRPA 2									
1970-1980	34,551	451,684	486,235	39,050	167,854	206,904	73,601	619,538	693,139
1980-2000	0	262,979	262,979	0	163,773	163,773	0	426,752	426,752
2000-2020	0	182,019	182,019	0	239,431	239,431	0	421,450	421,450
Total	34,551	896,682	931,233	39,050	571,058	610,108	73,601	1,467,740	1,541,341
WRPA 3									
1970-1980	4,468	592,039	569,507	446,218	256,927	703,145	450,686	848,966	1,299,652
1980-2000	0	568,694	568,694	0	279,958	279,958	0	848,652	848,652
2000-2020	0	414,437	414,437	0	379,386	379,386	0	793,823	793,823
Total	4,468	1,575,170	1,579,638	446,218	916,271	1,362,489	450,686	2,491,441	2,942,127
WRPA 4									
1970-1980	1,304	516,721	518,025	232,304	158,865	391,169	233,608	675,586	909,194
1980-2000	0	201,549	201,549	0	197,195	197,195	0	398,744	398,744
2000-2020	0	210,357	210,357	0	193,841	193,841	0	404,198	404,198
Total	1,304	928,627	929,931	232,304	549,901	782,205	233,608	1,478,528	1,712,136
WRPA 5									
1970-1980	3,430	360,504	363,934	377,429	205,631	583,060	380,859	566,135	946,994
1980-2000	0	192,128	192,128	0	205,329	205,329	0	397,457	397,457
2000-2020	0	180,611	180,611	0	271,637	271,637	0	452,248	452,248
Total	3,430	733,243	736,673	377,429	682,597	1,060,026	380,859	1,415,840	1,796,699
WRPA 6									
1970-1980	103	120,926	121,029	58,602	53,012	111,614	58,705	173,938	232,643
1980-2000	0	43,558	43,558	0	48,406	48,406	0	91,964	91,964
2000-2020	0	35,567	35,567	0	59,011	59,011	0	94,578	94,578
Total	103	200,051	200,154	58,602	160,429	219,031	58,705	360,480	419,185
WRPA 7									
1970-1980	3,807	122,379	126,186	30,307	86,739	117,046	34,114	209,118	243,232
1980-2000	0	147,079	147,079	0	63,027	63,027	0	210,106	210,106
2000-2020	0	25,321	25,321	0	57,573	57,573	0	82,894	82,894
Total	3,807	294,779	298,586	30,307	207,339	237,646	34,114	502,118	536,232
WRPA 8									
1970-1980	1,096	116,810	119,906	286,096	108,626	394,722	287,192	227,436	514,628
1980-2000	0	139,731	139,731	0	99,150	99,150	0	238,881	238,881
2000-2020	0	195,057	195,057	0	140,726	140,726	0	335,783	335,783
Total	1,096	453,598	454,694	286,096	348,502	634,598	287,192	802,100	1,089,292
WRPA 9									
1970-1980	16,784	193,411	210,195	275,284	140,906	416,190	292,068	334,317	626,385
1980-2000	0	225,837	225,837	0	145,281	145,281	0	371,118	371,118
2000-2020	0	655,217	655,217	0	317,268	317,268	0	972,485	972,485
Total	16,784	1,074,465	1,091,249	275,284	603,455	878,739	292,068	1,677,920	1,969,988
WRPA 10									
1970-1980	12,016	368,911	380,927	747,016	261,379	1,008,395	759,032	630,290	1,389,322
1980-2000	0	347,911	347,911	0	211,050	211,050	0	558,961	558,961
2000-2020	0	420,236	420,236	0	357,277	357,277	0	777,513	777,513
Total	12,016	1,137,058	1,149,074	747,016	829,706	1,576,722	759,032	1,966,764	2,725,796
Region									
1970-1980	78,308	2,872,496	2,950,804	2,493,054	1,449,050	3,942,104	2,571,362	4,321,546	6,892,908
1980-2000	0	2,130,275	2,130,275	0	1,413,978	1,413,978	0	3,544,253	3,544,253
2000-2020	0	2,318,822	2,318,822	0	2,016,150	2,016,150	0	4,334,972	4,334,972
Total	78,308	7,321,593	7,399,901	2,493,054	4,879,178	7,372,232	2,571,362	12,200,771	14,772,133

1/ Program Costs for 1) Natural Environment Lands and 2) Natural Environment Water Surface required in WRPA 2.
2/ Includes all other Program Costs for Water Surface and Lands, for Water Supply, Flood Control and Related Problems, Water Quality and Pollution, Navigation, Hydropower, Coastal and Estuarine, Historical and Archeological, and Health. See table 121.

Table 153 - Estimated Program Costs, Recommended Program, Lower Mississippi Region (Cont'd)

Planning Area & Time Frame	Annual Operation, Maintenance and Replacement								
	Federal			Non-Federal			Total		
	Natural Environment 1/	Other 2/	Subtotal	Natural Environment 1/	Other 2/	Subtotal	Natural Environment 1/	Other 2/	Total
WRPA 1									
1970-1980	0	7,000	7,000	6	12	18	6	7,012	7,018
1980-2000	0	7,000	7,000	6	27	33	6	7,027	7,033
2000-2020	0	7,000	7,000	6	55	61	6	7,055	7,061
WRPA 2									
1970-1980	31	2,357	2,388	574	8,401	8,975	605	10,758	11,363
1980-2000	31	6,631	6,662	574	17,235	17,809	605	23,866	24,471
2000-2020	31	12,066	12,097	574	30,367	30,941	605	42,433	43,038
WRPA 3									
1970-1980	0	9,508	9,508	53	15,089	15,142	53	24,597	24,650
1980-2000	0	18,402	18,402	53	26,970	27,023	53	45,372	45,425
2000-2020	0	34,258	34,258	53	48,114	48,167	53	82,372	82,425
WRPA 4									
1970-1980	3	7,498	7,501	12	9,800	9,812	15	17,298	17,313
1980-2000	3	11,111	11,114	12	17,649	17,661	15	28,760	28,775
2000-2020	3	17,625	17,628	12	29,073	29,085	15	46,698	46,713
WRPA 5									
1970-1980	13	5,597	5,610	26	8,657	8,683	39	14,254	14,293
1980-2000	13	10,271	10,284	26	15,478	15,504	39	25,749	25,788
2000-2020	13	16,867	16,880	26	26,533	26,559	39	43,400	43,439
WRPA 6									
1970-1980	0	1,600	1,600	0	3,215	3,215	0	4,815	4,815
1980-2000	0	2,162	2,162	0	5,293	5,293	0	7,455	7,455
2000-2020	0	2,924	2,924	0	7,762	7,762	0	10,686	10,686
WRPA 7									
1970-1980	13	900	913	10	2,612	2,622	23	3,512	3,535
1980-2000	13	2,715	2,728	10	3,994	4,004	23	6,709	6,732
2000-2020	13	3,701	3,714	10	5,810	5,820	23	9,511	9,534
WRPA 8									
1970-1980	0	5,305	5,305	114	7,273	7,387	114	12,578	12,692
1980-2000	0	10,902	10,902	114	14,316	14,430	114	25,218	25,332
2000-2020	0	19,670	19,670	114	24,650	24,764	114	44,320	44,434
WRPA 9									
1970-1980	68	6,637	6,705	44	10,286	10,330	112	16,923	17,035
1980-2000	68	14,276	14,344	44	20,943	20,987	112	35,219	35,331
2000-2020	68	26,260	26,328	44	34,191	34,235	112	60,451	60,563
WRPA 10									
1970-1980	0	19,429	19,429	88	20,714	20,802	88	40,143	40,[illegible]
1980-2000	0	33,040	33,040	88	38,641	38,729	88	71,681	71,769
2000-2020	0	53,295	53,295	88	66,195	66,283	88	119,490	119,578
Region									
1970-1980	128	65,831	65,959	927	86,059	86,986	1,055	151,890	152,945
1980-2000	128	116,510	116,638	927	160,546	161,473	1,055	277,056	278,111
2000-2020	128	193,666	193,794	927	272,750	273,677	1,055	466,416	467,471

Scheduling and Implementation

Using broad-scale analyses of water and related land resources availability, problems, and needs as a basis for study, the foregoing sections of this appendix describe a flexible framework of plans and programs outlining the probable nature, extent, cost, and timing of possible measures for needs satisfaction and problem amelioration through the year 2020. The alternative plans and programs, directed to improvements in the quality of life through maximum contributions to the objectives of national income and environmental quality are intended to serve as a guide to all local, State, and Federal interests directly concerned with conservation, development, and use of the resources. It is anticipated that any of the plans or programs selected as a basis for further detailed study will be subjected to a period of public review, and that public support of the plan or some appropriate derivative thereof will be obtained before scheduling and implementation are undertaken.

The framework program recommended by the Coordinating Committee is one that appears capable of fulfilling the region's future water needs in line with current national, State, and local objectives. Implementation of the program will require judicious planning, co-ordination, and funding, and will require immediate action to accelerate ongoing programs for water resources and related land development, especially the flood control programs currently underway.

Though the region is blessed with an abundance of water, excellent agricultural land, and other natural resources, it has historically been a slow growth center of the Nation. Part of this slowness of economic growth can be directly attributed to the harassment of floods which presently affect well over half the total area of the region despite the concerted and substantial flood control efforts of the past four decades. The most recent reminder of this problem is the disastrous 1973 flood that not only drove hundreds of people from their homes, but also purloined from the Nation's pocketbook several billion dollars in the form of property damages, clean-up operations, and the like.

The region's main line of defense against future disasters from flooding on the main stem and principal streams is the "Mississippi River and Tributaries Project." This project, authorized in 1928, is still less than 50 percent complete, partly because of the complexity of the problems and the magnitude of the developments necessary to solve them, and partly because of funding constraints over the years. To implement completion of this project as scheduled will require an increase in current appropriations to approximately $300 million per year. This would markedly advance the completion date expected under present funding levels; but, even then, the full benefits of the project could not be realized until the mid-1980's. Acceleration of both this project

and a current backlog of related works in upstream watersheds is most critical to the framework program because the fulfillment of many future needs of the region is dependent upon the adequate and timely provision of flood control. Funding requirements for accelerating the related functional programs could not be determined from available data for this study.

Excluding the appropriations necessary to continue and accelerate ongoing Federal programs (except for certain features of the Mississippi River and Tributaries Project), the funding schedule necessary to implement the recommended framework program for the region is summarized in table 156. This schedule calls for average annual short-term (1970-1980) expenditures of about $842 million, of which $295 million would consist of Federal investments in water and related land resources developments. This is about one and one-third times the present level of Federal funding. Present levels of non-Federal investments have not been determined. It can only be assumed that substantial increases will be required, as in the case of the Federal investments. For comparative purposes, the estimated funding requirement for alternative single-objective framework programs - National Income, Regional Development, and Environmental Quality - are summarized in table 157. The approximate percentages of funds required for main features of the recommended program and alternative programs through the year 2020 are given in table 158.

Provided that the necessary funds can be made available for the continuation of current programs and for the recommended framework program additions, specific authorization studies will be required before actual implementation of the program measures. Such studies will be required for all program components that are not currently authorized. Included in the authorized category are the MR&T Project, some projects for hurricane protection, several upstream watershed projects for flood control, and improvements to the system of navigation channels and locks in Louisiana. Proposed additions to these projects will require future authorization studies. Examples of projects and measures that will require specific authorization studies include proposed reservoirs; land acquisition for recreation, fish and wildlife, and environmental quality purposes; sediment and erosion control measures; drainage measures; and waste-treatment facilities for water quality control.

Where program measures are unlikely to be fully implemented within existing legal and institutional constraints, some changes may be required in Federal and State legislation to permit needs satisfaction. Cases in point include the proposals for subsidizing landowners, acquiring easements or otherwise regulating land-use practices to preserve the environmental quality values of lakes and streams, and to protect wildlife habitat values of certain land areas. They also include proposals for Federal participation in the development of single-purpose reservoirs for recreation.

Table 156 - Funding Schedule for Recommended Framework Program, Lower Mississippi Region

Public Investor	Funds Required ($1,000,000) 1970-1980	1980-2000	2000-2020
Federal			
Total Investment	2,951	2,130	2,319
Annual Investment 1/	295	107	116
Annual Operation, Maintenance and Replacement	66	117	194
Total Federal 2/	361	224	310
Non-Federal			
Total Investment	3,942	1,414	2,016
Annual Investment 1/	394	71	101
Annual Operation, Maintenance and Replacement	87	161	274
Total Non-Federal 2/	481	232	375
Grand Total 2/	842	456	685

1/ Total investment averaged over time period.
2/ Average annual appropriation required.

Table 157 - Funding Schedule for Alternative Programs, Lower Mississippi Region

Public Investor	Funds Required ($1,000,000) National Income 1970-80	National Income 1980-2000	National Income 2000-20	Regional Development 1970-80	Regional Development 1980-2000	Regional Development 2000-20	Environmental Quality 1970-80	Environmental Quality 1980-2000	Environmental Quality 2000-20
Federal									
Total Investment	2,829	2,130	2,319	3,132	2,489	2,703	3,263	1,921	2,319
Annual Investment 1/	283	106	116	313	124	135	326	96	116
Annual Operation, Maintenance & Replacement	65	115	192	73	136	236	65	115	192
Total Federal 2/	348	221	308	376	260	391	391	211	308
Non-Federal									
Total Investment	3,884	1,414	2,016	4,078	1,695	2,554	4,423	1,344	2,016
Annual Investment 1/	388	70	101	408	85	128	442	67	101
Annual Operation, Maintenance & Replacement	87	162	275	98	193	337	89	165	277
Total Non-Federal 2/	475	232	376	506	278	465	531	232	378
Grand Total 2/	822	453	684	882	538	836	922	443	686

1/ Total investment averaged over time period.
2/ Average annual appropriation required.

Table 158 - Percentage of Recommended Framework Program Cost for Main Features, Lower Mississippi Region

Feature	Percent of Program Cost			
	National Income	Regional Development	Environmental Quality	Recommended
Municipal Water Supply	1.9	2.1	1.8	1.9
Irrigation	0.7	1.0	0.7	0.7
Flood Control	21.2	20.3	20.5	21.1
Related Land Programs	3.7	3.7	3.5	3.7
Water Quality & Pollution	8.6	8.9	8.2	8.5
Navigation	11.1	9.8	10.6	11.0
Hydropower	1.0	0.8	0.9	0.9
Coastal & Estuarine	1.8	1.6	1.7	1.8
Recreation	28.2	31.8	27.0	28.0
Fish & Wildlife	3.6	4.3	3.5	3.6
Environmental Quality	16.8	14.4	20.2	17.4
Historical & Archeological	1.4	1.3	1.4	1.4
Health Aspects	0	0	0	0
	100.0	100.0	100.0	100.0

A further important consideration in implementing the program is the need for increased public awareness of the problems and increased public involvement in solving them. In particular, there is a need for accelerating educational programs to encourage agriculturalists to better match crops to land capability so that program acreages allocated to cropland can produce the regional share of the Nation's food and fiber. Active educational programs are needed also to promote public access to small ponds that can help meet the region's future needs for fishing.

DATA DEFICIENCIES AND NEED FOR ADDITIONAL STUDIES

DATA

During the conduct of the Lower Mississippi Region Comprehensive Study, several basic data deficiencies were noted. These deficiencies should be corrected through more intensive and systematic data collection and additional studies.

Indeed, the developing awareness of ecological values and the ramifications of environmental conservation programs dictate added study and research. Maximum land and water resource utilization is becoming increasingly important and attention should be devoted to a higher degree of resolution of diurnal changes and to statistical analysis of these short term effects on plant and animal life. Further use of satellite imagery is one tool which will permit better documentation of current land and estuarine uses and to develop optimum practices in the future.

Climatologic Data

A need exists for a better definition of microscale variations of the many parameters that collectively determine the climate of the Lower Mississippi Region. Instrumentation and data acquisition efforts should be directed to specific study areas. The very large urban areas, in particular, present gradual climatic changes in temperature and rainfall and other indices such as solar insolation, radiation, air pollution, etc., that are presently not well enough documented to permit reliable projections.

The Arkansas-Mississippi delta area and, to a lesser degree, the deltas of North Louisiana and the Missouri Boot Heel section comprise very important land areas manipulated through extensive crop management procedures and irrigation practices. This is being done with a very minimum of instrumental monitoring. Such monitoring is a prerequisite to meaningful research and should be expanded.

For river and flood forecasting, more data and research is required relative to evapotranspiration and soil moisture, and additional solar radiation measurements are desirable to increase the output accuracy of the Hydrologic Conceptual Model being adopted by the National Weather Service.

One other area of concern, in terms of geological history, is that climatic records are extremely short. Additional benchmark stations,

at sites relatively unaffected by man-made modifications of any sort, are required to assure a continuum of basic data acquisition that will constitute authentic, correlative climatic records. A step in this direction is the recently authorized climatic benchmark station to be established in the near future in the vicinity of Jackson, Tennessee. Data from that station will complement data from the other Lower Mississippi Region benchmark station established in 1968 at the Calhoun Experiment Station near Calhoun, Louisiana.

Meteorologic Data

Many of the data requirements for climatology have a parallel in the meteorology field. This is to be expected because many meteorological forecasting techniques and dynamic models have been largely dependent on climatic data. Furthermore, procedures for State and zone forecasts, and weather warnings of tornados, hurricanes, and floods in the study area, utilize climatic data to a large extent.

There is a need for satellite imagery with a higher degree of resolution for severe weather and hurricane monitoring and forecasting. More sophisticated radars with improved rainfall intensity evaluation are a requirement, and research is essential for greater accuracy in quantitative precipitation forecasts. Automation of data acquisition networks, both for land and offshore data buoys, are needed for timely acquisition of data that will permit prompt severe weather, tropical storm, and hurricane warnings to be issued. Additional tide gages as well as wave recorders for coastal areas and for inland bodies of water such as Lake Pontchartrain are needed to furnish data for research and study leading to development of more accurate storm surge and storm tide forecasts for the coastal areas of the Lower Mississippi Region study area.

Regional investigations need to be instituted to better define the parameters, the orographic and geophysical or areal effects, and other pertinent factors that make up the weather in the Lower Mississippi Basin under similar synoptic and upper air systems. The investigations should take into account local idiosyncrasies such as pollution sources, local wind pattern, small scale orographic features, and effects of local topography.

Hydrologic Data

Drainage Areas

One of the basic parameters in making a hydrologic study regarding low or flood frequency analysis, rainfall-runoff correlations, or design of structures to retard or control flows is the size of the drainage area of the basin being studied. The drainage areas of most streams in the Lower Mississippi Region are derived only at gaging stations for

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which data can be obtained from stage or discharge publications of the Corps of Engineers and USGS. However, the gaging site data are not always suitable for hydrologic studies of certain ungaged reaches of streams on which projects may be considered.

The drainage area information presented in the 1971 publication entitled "Drainage Area of Louisiana Streams" completed by the USGS and Louisiana Department of Public Works was a great aid in the comprehensive study. Additional drainage area publications are needed to cover the remaining areas of the Lower Mississippi Region.

Streamflow and Stage

Additional surface water data are needed to overcome deficiencies encountered during conduct of hydrologic studies.

The network of gaging stations shown in figure 52 of Appendix C, Regional Hydrology, Climatology and Geology, provides general coverage of hydrologic conditions over the entire region. However, there is a great deficiency of streamflow data for tributary streams with small drainage areas, especially in the upper reaches of the Mississippi River tributaries. Runoff characteristics of both large and small basins should be gaged to define the low, mean, and peak flows under various climatologic and topographic conditions.

In order to achieve a better understanding of the principles of flow patterns in the coastal area, more streamflow gaging stations should be developed. Very few discharge stations are included in the coastal areas, and determination of mean flows generated with WRPA's 8, 9, and 10 was a particular problem in the preparation of data for this study.

The data collected at gaging stations where discharge records are obtained by use of a water-stage recorder and a stage-discharge relationship, combined with intermittent discharge measurements, are sufficient for use in computing peak flow, low flow frequency, and duration data. Other data collected at crest-stage gage and peak flow measurement stations are useful but are insufficient for computing low flow frequency or duration data. In general, there is a lack of low flow data especially in the smaller drainage basins where changes in land-use patterns and climate could appreciably affect low flows. Low flow frequency information is of particular importance in providing a basis for the design of water supply reservoirs and systems for disposal, irrigation, and fish and wildlife propagation. The USGS system of placing daily discharge data in digital storage for later use in computing specific statistical information from these data should be expanded to include all streamflow and stage gaging stations within the region.

Studies using streamflow and stage data should attempt to further determine the effects of climatic, topographic, and man-made changes on streamflow characteristics of major basins. The effects of land-use

changes, agricultural practices, watershed protection measures, and the effects of urbanization on streamflow characteristics and natural basin runoff should be evaluated.

Flow Velocity

Few time of travel investigations have been undertaken and completed on streams in the Lower Mississippi Region. Those completed for streams in WRPA 7 are the only ones published to date. The remainder of such data used in this study were derived from preliminary sources. On some streams, flow velocities were derived for rather high flows. The most important time of travel data is that derived for condition of low flow. Time of travel information should be derived for the Mississippi River and its main tributary streams. Investigations should also be undertaken on small streams which may be affected by pollution from any source. The time of travel data should be determined for various river stages and for various stations along the stream so that a realistic evaluation of the capacity of the stream to assimilate waste at all ranges of flow can be established. Time of travel investigations during periods of flooding would be useful in determining the effect that channel improvement projects have on stream velocities and times of concentration, and on peak flows generated in the basins.

Water Use Data

Adequate information on water use is basic to the development of plans and programs for management of the region's water and related resources. The use of water has a pronounced effect on the supply and demand relationship because some uses deplete the supply while others do not. The amount of water diverted from the region's streams is of great importance; of equal importance is the amount returned directly or indirectly to the source of supply and the quality after use.

A particular problem encountered during the comprehensive study related to withdrawal and consumption of water by the power industry. Data compiled by one agency disagreed widely with data used by another agency. Inventories of the amount of water diverted from the region's streams and the amount consumed should be made by more systematic and standardized methods with responsibility for collection of the water-use data delegated to a single agency to avoid misinterpretation and duplication of effort.

Water Quality Data

A critical need exists to establish criteria for quantification of accurate water quality data covering a full range of pollutants, especially stressing non-BOD constituents such as heavy metals, temperature, odor, color, phenolics, nutrients, toxics, insecticides and pesticides, dissolved solids, and exotics.

STUDIES

Studies pertaining to the management, development, and use of the water and related land resources of the Lower Mississippi Region range from this comprehensive framework study to special studies of specific problem areas. More than 60 studies of varying type and scope are currently underway and should generally be completed within the 1970-1980 time frame. In addition to these, others are needed to provide basic planning data and sufficiently detailed information for future authorization of specific water resource developments.

There is under consideration a reconnaissance level (Level B) study for the State of Mississippi to identify and recommend plans and programs to be pursued by Federal, State, and local entities, and to provide a basis for subsequent implementation studies. The state-wide study would cover all of WRPA's 4 and 7 and small portions of WRPA's 3 and 8 in the Lower Mississippi Region.

General Investigations

Traditional Studies

Authorized Federal agency feasibility studies for the purpose of project authorization or development of plan implementation in the region include numerous single purpose and multipurpose studies. The authorized studies are summarized by planning area and study purpose in table 159. Needs for future studies are summarized in like manner in table 160.

Urban Studies

Studies for the purpose of formulating programs to solve specific urban water problems and to serve as a catalyst for solving other related urban problems have been authorized for the Pine Bluff Metropolitan Area in Arkansas (WRPA 5), the New Orleans-Baton Rouge Metropolitan Area in Louisiana (WRPA's 9 and 10), and the Memphis Metropolitan Area in Tennessee, Arkansas, and Mississippi. Both the Pine Bluff and New Orleans-Baton Rouge studies are underway, with estimated completion in 1977. Needs for additional urban studies are summarized by WRPA in table 161.

Waste Water Management Studies

Studies for the purpose of formulating programs to solve urban waste water problems and to serve as a catalyst for solving other related urban problems are needed in WRPA's 4 and 5. These needs are summarized in table 162.

Table 159 - Authorized Traditional Type General Investigation Surveys, Lower Mississippi Region

Study Purpose and Location	Remarks
WRPA 1	
Navigation	
Mississippi River, Baton Rouge to Natchez, La. and Miss.	Study underway. Completion not scheduled.
WRPA 2	
Flood Control	
Eight Mile Creek, Ark.	Study underway. Estimated completion 1975.
Laconia Circle, Ark.	Not started.
Navigation	
Mississippi River, Phillips Co., Ark.	Study underway. Completion not scheduled.
St. Francis River, Ark.	Not started.
Fish and Wildlife	
St. Francis River, Ark. and Mo.	Not started.
Multi-Purpose	
Bayou Meto Basin, Ark.	Study underway. Purposes include flood control, water supply, and fish and wildlife. Estimated completion 1975.
St. Francis River below Wappapello, Mo. and Ark.	Study underway. Purposes include flood control and seepage. Completion not scheduled.
St. John's Bayou and New Madrid Floodway, Mo.	Study underway. Purposes include flood control and fish and wildlife. Estimated completion 1974.
White River Navigation to Batesville, Ark.	Study underway. Purposes include navigation, power, fish and wildlife, and recreation. Estimated completion 1975.

Table 159 - Authorized Traditional Type General Investigation Surveys, Lower Mississippi Region (Cont'd)

Study Purpose and Location	Remarks
WRPA 3	
Flood Control	
Columbus to Hickman, Ky.	Study underway. Completion not scheduled.
East Bank Levees, Tenn. and Ky.	Not started.
Wickliffe to Columbus, Ky.	Study underway. Completion not scheduled.
Multi-Purpose	
Bayou DuChien, Ky.	Study underway. Purposes include flood control, recreation, and fish and wildlife. Completion not scheduled.
Hatchie River and Tributaries, Tenn. and Miss.	Study inactive. Purposes include flood control, recreation, and fish and wildlife.
Mississippi River at Memphis, Tenn.	Study underway. Purposes include navigation and recreation. Estimated completion 1975.
Nonconnah Creek, Tenn.	Study underway. Purposes include flood control, fish and wildlife, and recreation. Estimated completion 1974.
Obion and Forked Deer Rivers and Tributaries, Tenn. and Ky.	Study underway. Purposes include flood control, fish and wildlife, recreation, water quality, water supply, and drainage. Estimated completion 1976.
Wolf, Loosahatchie Rivers and Nonconnah Creek, Ky.	Study underway. Purposes include flood control, fish and wildlife, and recreation. Completion not scheduled.

Table 159 - Authorized Traditional Type General Investigation Surveys, Lower Mississippi Region (Cont'd)

Study Purpose and Location	Remarks
WRPA 4	
Navigation	
Vicksburg Harbor, Miss.	Study underway. Estimated completion 1975.
Multi-Purpose	
Yazoo Basin, Miss.	Study underway. Purposes include flood control, power, fish and wildlife, drainage, irrigation, recreation, navigation, water supply, and water quality. Estimated completion 1978.
WRPA 5	
Flood Control	
Columbia, La.	Study inactive.
Multi-Purpose	
Little Missouri River Basin	Study inactive. Purposes include flood control, power, recreation, fish and wildlife, water supply, and water quality.
Ouachita Basin	Study underway. Purposes include flood control, power, fish and wildlife, navigation, irrigation, water supply, recreation, water quality, drainage, and bank stabilization. Estimated completion 1978.
Saline River, Ark.	Study inactive. Purposes include flood control, power, recreation, water supply, and water quality.

Table 159 - Authorized Traditional Type General Investigation Surveys, Lower Mississippi Region (Cont'd)

Study Purpose and Location	Remarks
WRPA 6	
Navigation	
Lake Providence, La.	Study underway. Estimated completion 1977.
WRPA 7	No studies authorized.
WRPA 8	
Flood Control	
Amite River and Tributaries, La.	Study inactive.
Navigation	
Bayou Manchac and Amite River, La.	Study inactive.
Multi-Purpose	
Louisiana Coastal Area	Study underway. Covers coastal areas in WRPA's 8, 9, and 10. Purposes include hurricane protection, land building, and other purposes. Estimated completion 1979.
WRPA 9	
Flood Control	
Rapides, Boeuf, Cocodrie, La.	Study underway. Estimated completion 1975.
Navigation	
Catahoula - Charenton, La.	Study underway. Estimated completion 1975.
Gulf Intracoastal Waterway High Level Crossing, La.	Study underway. Covers areas in WRPA 10. Estimated completion 1976.

Table 159 - Authorized Traditional Type General Investigation Surveys, Lower Mississippi Region (Cont'd)

Study Purpose and Location	Remarks
WRPA 9 (Cont'd)	
Multi-Purpose	
Atchafalaya Basin, Water and Related Land Resources, La.	Study underway. Purposes include flood control, navigation, water supply, walt-water intrusion, water-level management, land building, drainage, irrigation, recreation, and fish and wildlife. Estimated completion 1979.
Mermentau, Vermilion and Calcasieu Rivers, and Bayou Teche, La.	Study underway. Purposes include flood control, navigation, water supply, water quality, salt-water intrusion, recreation, and fish and wildlife. Estimated completion 1979.
Southwest Louisiana River Basin Study	Study underway. Purposes include flood control, recreation, fish and wildlife, water quality, drainage, irrigation, bank stabilization, and seepage.
WRPA 10	
Navigation	
Barataria Bay Water (Entrance Channel), La.	Study underway. Estimated completion 1976.
Bayou La Loutre, St. Malo, and Ycloskey	Study underway. Estimated completion 1975.
Mississippi River-Gulf Outlet, La.	Study underway. Estimated completion 1974.
Hurricane Protection	
Lake Pontchartrain - Jefferson Parish, La.	Not started.

Table 159 - Authorized Traditional Type General Investigation Surveys, Lower Mississippi Region (Cont'd)

Study Purpose and Location	Remarks
WRPA 10 (Cont'd)	
Multi-Purpose	
Lake Pontchartrain - North Shore, La.	Study underway. Purposes include flood control and shore protection. Estimated completion 1975.
West Bank of Mississippi River at and in the vicinity of New Orleans, La.	Study underway. Purposes include flood control and hurricane protection. Estimated completion 1974.
Bank Stabilization	
Barataria Bay Waterway (Dupre Cut), La.	Study underway. Estimated completion 1977.

Table 160 - Needs for Future Traditional Type General Investigation Surveys, Lower Mississippi Region

Study Purpose and Location	Remarks
WRPA 1	
Multi-Purpose	
Mississippi River Floodway, Cairo to Gulf	Purposes include recreation and fish and wildlife.
WRPA 2	
Multi-Purpose	
St. Francis Basin, Ark.	Purposes include flood control, recreation, power, and others.
Bayou Des Arc, Ark.	Purposes include fish and wildlife and recreation.
Grand Prairie Review, Ark.	Purposes include irrigation and others.
Horseshoe Lake, Ark.	Purposes include fish and wildlife, recreation, and irrigation.
WRPA 3	
Flood Control	
Horn Lake, Miss.	
Navigation	
Mississippi River, West. Tenn.	

Table 160 - Needs for Future Traditional Type General Investigation Surveys, Lower Mississippi Region (cont'd)

Study Purpose and Location	Remarks
WRPA 5	
Flood Control	
Lower Red, Black, and Tensas Rivers, La.	
Multi-Purpose	
Larto Lake-Saline Lake Area, La.	Purposes include flood control, recreation, fish and wildlife, and water quality.
WRPA 7	
Multi-Purpose	
Homochito River-Buffalo River, Miss.	Comprehensive study to include investigation of bank caving in these river basins.
WRPA 8	
Flood Control	
Amite River near Denham Springs, La.	
Navigation	
Bayou Sorrel Lock, La.	
Port Allen Lock, La.	
WRPA 9	
Flood Control	
Bayou Latenache, La.	
Navigation	
Bayou Boeuf, La.	
Freshwater Bayou, La.	
Vermilion River, La.	

Table 160 - Needs for Future Traditional Type General Investigation Surveys, Lower Mississippi Region (cont'd)

Study Purpose and Location	Remarks
WRPA 9 (Cont'd)	
Multi-Purpose	
Cameron-Creole, La.	Purposes include flood control and hurricane protection.
Louisiana Intracoastal Seaway	Purposes include navigation and fish and wildlife.
Lower Calcasieu River Basin, La.	Purposes include flood control, navigation, water supply, hurricane protection, salt-water intrusion, and fish and wildlife.
WRPA 10	
Navigation	
Bayou Bonfouca Waterway, Empire to the Gulf, La.	
Hurricane Protection	
Boutte and vicinity, La.	
Buras-Port Sulphur, La.	
Lafitte and vicinity, La.	
Larose to Golden Meadow, La.	
Westwego and vicinity, La.	

Table 160 - Needs for Future Traditional Type General Investigation Surveys, Lower Mississippi Region (cont'd)

Study Purpose and Location	Remarks
WRPA 10 (Cont'd)	
Multi-Purpose	
Bayou Chinchuba-Castine, La.	Purposes include flood control and hurricane protection.
Houma and vicinity, La.	Purposes include hurricane protection and water supply.
Morgan City and vicinity, La.	Purposes include hurricane protection and flood control.
Slidell and vicinity, La.	Purposes include hurricane protection and flood control.

Table 161 - Needs for Future Urban Studies, Lower Mississippi Region

Study Location	Time Frame
WRPA 3	
Jackson-Madison Co., Tenn.	1970-1980
WRPA 4	
Greenville, Mississippi	1970-1980
Greenwood, Mississippi	1980-2000
WRPA 5	
Monroe, Louisiana	1980-2000
WRPA 9	
Alexandria Metropolitan Area, La.	1970-1980
Lafayette Metropolitan Area, La.	1970-1980
Lake Charles Metropolitan Area, La.	1980-2000

Table 162 - Needs for Future Waste Water Management Studies, Lower Mississippi Region

Study Location	Time Frame
WRPA 4	
New Albany, Miss.	1980-2000
Vicksburg, Miss.	1980-2000
WRPA 5	
Camden-Calion Area, Ark.	1980-2000
Hot Springs, Arkadelphia Area, La.	1980-2000

Special Continuing Authorities

Navigation

Four studies in the Lower Mississippi Region are being conducted under authority of Section 107 of the 1960 River and Harbor Act, as amended. These include: (1) Caruthersville, Missouri, in WRPA 2, (2) Mississippi River below Commerce, Missouri, in WRPA 2, (3) Rosedale Harbor, Mississippi, in WRPA 4, and (4) Bayou Barataria, Bayou Perot, Louisiana, in WRPA 10. Estimated completion of the first three studies is 1974, the other 1975.

Flood Control

Eleven ongoing flood control studies are being conducted under authority of Section 205 of the 1948 Flood Control Act, as amended. The ongoing Section 205 studies are summarized in table 163. Needs for future studies under that authority are given in table 164.

Table 163 - Current Flood Control Studies Under Authority of Section 205 of the 1948 Flood Control Act, as Amended, Lower Mississippi Region

Study Location	Estimated Completion
WRPA 2	
Drinkwater Sewer, Mo.	1975
Inter-River D.D., Mo.	1974
Jonesboro, Ark.	1975
Long Lake, Ark.	1974
Martin's Branch, Ark.	1975
WRPA 3	
Huntingdon, Tenn.	1974
North Fork Big Creek, Tenn.	1975
Southaven, Miss.	1975
WRPA 4	
East Bank, Yazoo City, Miss., Mile 73	1974
Hatcher Bayou and Durden Creek, Miss.	1975
Lead Bayou, Miss.	1974

Table 164 - Need for Future Flood Control Studies Under Authority of Section 205 of the 1948 Flood Control Act, as Amended, Lower Mississippi Region

Study Location	Time Frame
WRPA 3	
Cowpen Creek, Miss.	1970-1980
WRPA 8	
Bayou Gross Tete - Bayou Portage, La.	1970-1980
New River near Gonzales, La.	1980-2000
Tickfaw, Nantalbany, Ponchatoula Rivers, La.	2000-2020
WRPA 9	
Calcasieu River near Oakdale, La.	1970-1980

Flood Plain Information Studies

The delineation of flood problems, including descriptions of the extent, depth, probability, and duration of historic and potential floods, is currently needed for 68 communities in the region. A WRPA summary of these communities is given in table 165.

Table 165 - Needs for Future Flood Plain Information Studies, Lower Mississippi Region

	Planning Area (WRPA)									
Communities	2	3	4	5	6	7	8	9	10	Region
Total Number	22	6	5	5	1	1	8	16	4	68

Needs for Flood Plain Information Studies in addition to those listed will probably arise in the future. Related flood insurance studies should be made throughout the region as the need arises for such studies.

Other Special Studies

Studies Underway

Flood Control. Special studies underway in connection with the ongoing Mississippi River and Tributaries Project include: (1) a drainage study for Craighead and Green Counties, Arkansas, in WRPA 2, (2) a levee study in the vicinity of Tiptonville, Tennessee, in WRPA 3, and (3) an analysis aimed at defining stage increases on the Mississippi River as a result of operation of pumping plants which are a part of the tributary flood control feature of the MR&T Project (tentative conclusions are that stage increases are insignificant). Estimated completion of both studies is 1975. A special flood control study of Fifteen Mile Bayou, Arkansas, in WRPA 2, should be completed about 1974.

Coastal and Estuarine. Two authorized studies, the Atchafalaya Water and Land Resources Study and the Louisiana Coastal Area Study, listed on table 159, may lead to the authorization of projects for the solution of the water and related land resources problems affecting the Louisiana Coastal Zone and the Atchafalaya Basin. The results of these studies and others already completed in this important portion of the Lower Mississippi Region should be consolidated into one report and kept current by updating once every 5 years. Continued emphasis should be placed on ways in which the productive capacity of the estuaries can be maintained at the highest level possible concomitant with continued mineral extraction and its attendant development.

Dam Safety. An inventory of dams in Louisiana and Mississippi is underway. Estimated completion of the inventory is 1975.

Strip Mining. A study of strip mining and associated water pollution in the Lower Mississippi Region is in progress. The study should be completed in 1974.

Studies Needed

Flood Control. A drainage study is needed at Portageville Bay, Missouri, in WRPA 2, in connection with the ongoing Mississippi River and Tributaries Project.

Irrigation. A specific study should be directed at determining best application time for irrigation water in the region and development of more efficient irrigation systems. The study should investigate specific land classification parameters such as Sodium-Absorption Ratio and Hydraulic Conductivity, and should evaluate the region's water supplies for irrigation suitability. In addition, the study should assess the overall impact of irrigation on water quality and, as a lesser objective, it should develop methods of improving weather forecasting as it might prove beneficial to irrigation.

Water Quality. A study should be undertaken and oriented toward pointing the way for specific State-Federal actions to quantify inorganic

pollutants, define ways in which public funds can be used most advantageously to supply cost sharing for pollution abatement works, establish definitive continuing water quality monitoring systems, recommend practical measures to insure the maintenance of clean water, and recommend legal, social, and institutional changes needed to insure attainment of the above. Specific subjects which should be investigated include:

1. Municipal waste source inventory that includes data on population served, design flow, plant efficiency data, and bacteriological controls. Also included should be a listing of industries that discharge to municipal sewers.

2. Industrial waste source inventory that includes four-digit SIC classification, number of employees, general manufacturing processes, commodities produced, quantity of discharge, and designation of discharge point (municipal sewer, receiving stream, etc.).

3. Agricultural waste source inventory that includes feed lots, irrigation return flows, rural sanitation, pesticides, fertilizers, and erosion.

4. Water quality monitoring on a long-term continuous basis at key locations on streams, lakes (reservoirs), and coastal waters.

5. Cost analyses of waste treatment practices and levels of treatment attainable by the various treatment practices.

6. Research into the applicability and feasibility of water quality control through effluent component reclamation, increased industrial efficiency, and other means of lessening industrial effluent concentrations.

7. Research into sediment transport relative to agricultural chemicals and fertilizers, how these pollutants adhere to soil particles, time of travel, and effects on downstream water quality.

Sediment and Erosion Control. More detailed studies of the effects of changes in streamflow patterns on the sedimentation of streams in the region should be made. The chief sources of erosion should be identified, and estimates of the quantities of sediment yields from each source should be derived. This information will be of great value in formulating measures to reduce or control sediment and erosion in streams and in the planning of future channel modification, flood control, and navigation projects.

Ground Water. Ground-water investigations are needed throughout the region to accurately define the potential yield of all aquifers. Although present ground-water withdrawals in most areas can be increased, the practical limits of development must be determined for better planning and management. Reconnaissance studies are needed to better define the

areal extent, hydraulic characteristics, potential yield, quality of water, and the effects of withdrawals on all aquifers. Detailed studies are needed in present and potential areas of large withdrawal to avoid problems of inadvertent local overdevelopment of ground water. Other objectives of such investigations should include:

1. Studies for a better understanding of the ground-water/surface-water relationship to permit evaluation of the effects of a changing environment.

2. The effects of changes in vegetation resulting from urbanization and land clearing for farming on evapotranspiration, infiltration, runoff, and ground-water discharge need to be studied. How changes in these parameters affect the potential ground-water yield in the region should be assessed.

3. Work relating to the practicability of artificial ground-water recharge of shallow aquifers should be continued and should be expanded in scope to include all aquifers. Investigations should include methods of recharge by flooding as well as injection through wells and should, as a joint effort with water quality studies, address the possibility, practicability, and feasibility of underground disposal of wastes.

4. Investigations to determine the potential yield of saline ground water should be continued in more detail in those areas where initial studies have been made and studies are needed for the remainder of the region. The feasibility of mixing saline and fresh water to increase the supply of potable water should be determined.

5. The Quaternary alluvial and terrace deposits warrant special attention as the primary source of ground water in the region, accounting for about two-thirds of the potential supply. The aquifers in the Quaternary deposits are adaptable to an annual cycle of withdrawal and replenishment. Withdrawals may be made up to the limit of the average annual recharge. Investigations are needed to define the recharge rate (including variations by area and conditions of precipitation), the effects of withdrawals on streamflow, and the effects on the ecology of the region.

Land Use, General. An accurate expression of land use is needed especially as regards lands covered by lakes, ponds, and streams. Satellite mapping should provide the base for accurate land use definition.

Rampant contradiction exists between State, Federal, and other agency information concerning large water areas throughout the region. Nearly every publication gives a different surface area for these water bodies.

There is presently no inventory of ponds in the region. Ponds are a significant resource for fish and wildlife and to some extent recreation as it relates to fishing. A study should be conducted not only to inventory the region's ponds, but also to investigate ownership with a primary objective of outlining ways in which more ponds can be made available for use by fishermen and recreationists.

As with ponds, there exists no accurate data on the region's streams. It appears that there are as many as 89,400 miles of streams throughout the region, but very little is known about them. A stream inventory should be made to determine the following stream characteristics:

1. Whether a stream is natural or has been modified by man. If the stream was modified, the inventory should show the extent of the modification.

2. Stream data, including stream width, depth, and length, and streambank vegetation should be generally described for a strip approximately 200 feet wide adjacent to each bank. Other parameters which should be studied are stream water quality, accessibility of the stream for use by the public, and aesthetic qualities of the stream.

3. The land-use investigation should be assigned a single agency, but should be a coordinated effort. At the present time, several States are in the early stages of development of land-use plans, but each has its own system for classifying land use. All State efforts should be coordinated and a standard system of land-use classifications should be adopted regionwide. The study should also accurately define ownership of the region's lands and expand on this framework study regarding means of making lands available to simultaneously satisfy multiple needs as food and fiber, recreation, fish and wildlife, and aesthetics.

Land Use, Main Stem Mississippi River. A comprehensive land-use plan is needed for the lands lying adjacent to the main stem of the Mississippi River in WRPA 1. A study with this objective should be started immediately to determine the possibility of establishing a national park and multi-purpose recreation area along the river from St. Louis to New Orleans, with special emphasis on designing intensive use recreation areas in proximity to the region's major population centers. The study's primary objective should be the formulation of a comprehensive coordinated land-use plan by a single agency, to be coordinated with the States and cities along the river, taking due cognizance of all studies and investigations which have been made to date by Federal and State agencies. The study should include information similar to that available on the Upper Mississippi River.

Land Use, Forests. Studies are needed of means to implement an analytic system for continuous inventory of the forest resources within the region, with emphasis on forest conditions. present production, and

potential production. This study could be an element in the overall land-use study discussed above. Such a system should provide the following information on the effects of clearing forest lands:

1. How land clearing affects the ability of the region's forest industries to sustain themselves now and in the future, and how the regional economy will be affected should land clearing continue.

2. How land clearing relates to flooding within the region, specifically whether flood problems are aggravated thereby and how much.

3. How clearing affects the environment, specifically investigating parameters such as wind velocity, temperature, wildlife, carrying capacity, soil and water loss, and regenerative capacity of the forest.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The Lower Mississippi Region has adequate natural resources to support substantial economic growth. Projections for the period 1970-2020 indicate that regional population will increase 62 percent; employment will increase 77 percent, and average earnings per worker will increase 331 percent; agricultural production will double, petroleum output will quadruple, and manufacturing will expand tenfold. In line with this growth, there will be increasing demands upon the water and related land resources of the region. The major needs and problems are concerned with water supplies for municipal, industrial, thermoelectric power generation, energy production, and irrigation; and developments for navigation, flood control, land treatment and management, fish and wildlife habitat, and water-oriented outdoor recreation.

The water supply problems are related mostly to resource distribution, rather than availability. As requirements increase, careful planning will be required to insure the availability of supplies when and where needed. The maintenance of water supplies for manufacturing purposes will be especially important to the economic growth of the region. The maintenance and improvement of navigation facilities will be similarly important.

The existing navigation system in the Lower Mississippi Region is a major asset to the economic stability of the Nation. It is indispensable to the movement of inland waterways commerce to and from the heartland of the Nation, and provides a major outlet to world markets. The second ranked port facility in the United States is located within the region at New Orleans, Louisiana, and in 1970 one out of every seven tons of the Nation's waterborne commerce was moved on waterways and through ports in the region. In terms of ton-miles of traffic, this amounted to a little over one-fourth of the United States total that year. Waterborne commerce tonnages forecast for the years 1980 and 2020 will be about 138 and 467 percent, respectively, of 1970 levels.

This region currently supplies from one-fourth to one-third of the Nation's energy in the form of petroleum, natural gas, and natural gas liquids. The continued and careful development of these and other forms of energy (electric power) will become increasingly important as energy requirements increase and available resources dwindle. Development of energy sources must continue, but such development must also incorporate measures which minimize adverse environmental impacts.

Extensive flood control improvements have been made in the Lower Mississippi Region, but flooding still is and will continue to be a

serious problem. Average annual flood damages to urban and built-up developments alone, are estimated at $40 million, based on 1970 conditions. These damages occur in densely populated urban areas such as New Orleans, Louisiana, and Memphis, Tennessee, as well as numerous smaller cities and communities. Average annual damages which occur in the outlying rural areas are estimated at $172 million. In terms of the total problem, approximately half the entire area within the Lower Mississippi Region is subject to flooding. Most of the flood-prone lands are used for crop production and pasture; and unless additional measures are undertaken, extensive flood damages on principal streams and in upstream watersheds will increasingly hamper the region's capability to produce the food and fiber essential to the economy and well-being of the region and Nation.

The Coordinating Committee is confident that the region will be called upon to supply a greater portion of the Nation's food in the future. Moreover, world conditions in 1974 - vastly different from those at the beginning of the study - indicate that exports of agricultural products beyond 1980 will probably increase at a greater rate than that assumed for this study. To meet this increased need for food will require continued and accelerated planning for flood control and other resource development measures to ameliorate the major agricultural losses attributable to flooding. It will further require continued institution of land treatment and drainage measures, sediment and erosion control measures, and the use of supplemental irrigation.

A major portion of the region's structural measures for flood control include levees and floodwalls, channel improvements, pumping stations, and reservoirs constructed in connection with the Mississippi River and Tributaries Project. This project alone prevented an estimated $13 billion in flood damages in 1973, even though the overall project was less than 50 percent complete. The damages prevented in 1973 were more than 6 1/2 times the amount of funds expended on this project to that time. However, more than $700 million in damages still occurred. Accelerated completion of this project and upstream watershed projects,will be a critical factor in maintaining the region's capability to supply food and fiber, petroleum products, and other items of commerce. Until this critical project is complete, the region has no protection against the project design flood, and the potential for a disastrous flood event will continue to exist. Without question, flood control on the Mississippi River and tributaries is the region's most pressing problem.

The discharge of raw or inadequately treated municipal and industrial wastes is seriously degrading the quality of water in some reaches of the Mississippi River and its tributaries. There are also problems from nonpoint sources of agricultural pollution and nonbiodegradable wastes discharged to streams. If these problems are to be satisfactorily solved, there must be a regionwide water quality program that includes orderly and sustained monitoring, increased levels of waste

treatment, increased efficiency in the operation of treatment facilities, and increased enforcement of State stream standards. The nature and magnitude of pollution problems associated with nonbiodegradable wastes must be better defined, and adequate control measures devised.

Conversion of land to satisfy urban requirements, cropland and pasture needs, and other needs related to predominately open land areas, will infringe upon the satisfaction of needs for forested wildlife habitat. Some forested areas can be restricted to primary use for wildlife habitat, but most will have to be carefully managed under multiple-use sustained yield principles to satisfy both wildlife and food and fiber requirements of the region.

Demand for water dependent and water-oriented recreation opportunities on lakes and reservoirs large enough for boating, water skiing, and the like will exceed available supplies within the near future. Part of those demands can be met through more intensive use of existing lakes and reservoirs, and multiple-use of reservoirs that will be created for flood control, water supply, power, or some other purpose, and part can be met through the construction of single-purpose recreation projects. But even then, there is limited potential for developing large lakes in the region, and some of the needs will go unmet unless recreationists are willing to accept a far lesser quality water recreation experience than assumed for this investigation, or to substitute other recreation experiences.

Many opportunities for the enhancement, conservation, and preservation of environmental values, coastal and estuarine resources, archeological resources, and public health exist in the region. These opportunities are recognized in the comprehensive framework program and timely implementation of that program can contribute substantially to meeting the requirements of the region as foreseen at this time. However, it must be recognized that the framework program is based on long-range assumptions and projections, and that periodic reviews and updating at appropriate intervals will be required to keep it abreast of future changes in national, State, and local conditions.

Implementation of the framework program in an effective manner will require coordinated and expeditious action at all levels of govermnnt and the private sector. It will require further detailed studies of sufficient scope to provide the basis for authorization of specific projects, and it will require meaningful and sustained local, State and Federal financial support. In some areas, new legislative support will also be required.

RECOMMENDATIONS

In light of study findings, the Coordinating Committee recommends:

1. That the comprehensive program summarized in table 154 and discussed in this appendix be adopted as the framework for the development, management, and beneficial use of the water and related land resources of the Lower Mississippi Region.

2. That this report be the base document for further detailed authorization reports covering component plans of the framework program.

3. That Federal, State, and local plans and programs be implemented as necessary to support the economic growth projected for the National Income Objective and to make contributions to the Environmental Quality Objective. Special emphasis should be given to the satisfaction of needs for food and fiber, flood control, water supply, inland navigation, sediment and erosion control, land drainage, fish and wildlife conservation and enhancement, outdoor recreation and water quality control, and for enhancement, conservation, and preservation of environmental values, archeological and historical resources, and public health.

4. That ongoing studies and projects for management and development of the region's water and related land resources be expeditiously funded to completion and accelerated wherever possible.

5. That plans for improving navigation waterways and port facilities to meet short-terms transportation needs associated with projected economic growth be expedited.

6. That satisfaction of future needs of the mineral industry, especially those for petroleum, natural gas, and natural gas liquids, be given high priority through the provision of (1) reasonable access to mineral sources for both exploration and development purposes, (2) dependable water supplies based upon competitive principles, and (3) policies and programs encouraging domestic minerals development, supported by meaningful research efforts, and with due consideration to long range social and environmental impacts.

7. That studies be accelerated to locate potential energy sources, to determine new locations for electric power plants and transmission facilities, and to devise new technologies for blending developments for energy generation with the natural environment.

8. That mining activities incorporate such measures as are necessary to control the discharge of pollutants into streams and, in the case of surface mining, provide measures to restore the topography and

vegetation of excavated areas to original conditions, insofar as possible, upon cessation of the mining activities.

9. That presently authorized flood control projects for principal streams and upstream watersheds be accelerated to meet short-term needs, with special emphasis on accelerated completion of the Mississippi River and Tributaries Project.

10. That flood plain information studies be accelerated, and that joint action be taken by Federal, State, and local agencies to establish and implement appropriate flood plain management programs.

11. That the water quality improvement plan for the region be implemented with high priority. This plan seeks solutions to present water quality problems and includes measures to alleviate the effects of additional development to the extent practicable. Recognizing that the formulated water quality plan is incomplete in that the region's most serious water quality problem, that of pollutants other than 5-day BOD and bacteria, is not included for reasons explained herein, an accelerated effort should be made to satisfactorily formulate a total water quality plan for the Lower Mississippi Region.

12. That Federal and State programs to solve water pollution problems be adequately funded; techniques for achieving higher levels of wastewater treatment be improved; State stream quality standards be enforced; measures be developed for controlling non-point sources of agricultural pollution; and that non-BOD pollutants be studied in sufficient detail to define the magnitude of the problem and devise adequate control measures.

13. That an extensive land use and capability analysis employing satellite photographs and/or other techniques be made to accurately define current use and enhance prospects for achieving the best future use of the region's land resources.

14. That a land management program be pursued for purposes of coordinating future land uses, matching land use to land capability, and instituting proper land treatment and protection measures. Land treatment and management, sediment and erosion control, and land drainage programs should be accelerated to preserve and enhance the productive capacity of the land resource base.

15. That studies of presently irrigated lands and potentially irrigable land be refined in sufficient detail to insure proper management and best use of the region's land and water resources for future developments.

16. That effective land-use policy and planning be implemented to insure preservation of urban open and green space, unique natural areas,

archeological and historical resources, scenic rivers, streams and lakes, and to insure the protection of fish and wildlife, including rare and endangered species.

17. That development of improved plant and crop species, fertilizers, and disease control be continued; that management practices such as clipping, proper cattle/acre ratio, and supplemental irrigation be continued; and that the use of feed lots be increased to help meet beef and veal production requirements.

18. That intensive forest management including timber stand improvement practices, increased protection from insects, fire and disease, and improved forest product utilization be accelerated.

19. That regionwide information and education programs be initiated to make all governmental agencies, private organizations, and individual citizens aware of the problems and needs in water and related land resources, so that coordinated action in regard to planning, development, and protection of all the region's natural resources can be attained. Special consideration should be given to educating landowners to the need for allowing cropping patterns to change so as to approach maximum production from each acre under cultivation; making more on-farm ponds available to the general public for fishing purposes; and for allowing the general public better access to scenic areas, to private lands for hunting and recreation, and to other multiple-use areas.

20. That continued emphasis be placed on formulation of improved policies and procedures for evaluating the feasibility of water and related land resource developments, for evaluating associated environmental aspects, and for reducing the time lag between authorization and implementation of feasible water and related land resource developments.

21. That reservoirs for flood control, power, water supply, and related purposes be designed and operated to provide maximum multiple-use within the reservoir basin and to provide optimum downstream benefits; that these provisions be enhanced through periodic review and updating of reservoir operations; and that single-purpose reservoirs for recreation be constructed to meet needs associated with the projected economic growth.

22. That sufficient land area and water supply be managed to satisfy primary use needs for fish and wildlife purposes; and that additional land areas and water supply be managed in such a manner as to yield maximum fish and wildlife benefits, but not to the exclusion of other compatible or complementary uses.

23. That environmental control programs be developed at all levels of government to support present programs which protect the public against health hazards from air, water, and vector-borne diseases.

24. That a study be made to determine the adequacy of Federal and State laws and policies to carry out needed water resource programs and make recommendations concerning new legislation and policies that may be required. Special consideration should be given to legislation and policies concerning plaintiff requirements, legal responsibility, and bonding requirements in environmental disputes.

25. That the additional data collection and studies discussed in this appendix be made as soon as practicable by appropriate entities to provide a more comprehensive data bank from which more effective detailed planning can be done.

26. That the well-being of the people remain the principal criterion in formulating specific project proposals for management of the region's resources.

27. That each of the affected and concerned Federal and non-Federal agencies make periodic review and update of the program components for which it is or may be, under law, assigned responsibility to maintain the framework outlined herein as a viable planning tool in light of changing regional and national priorities.

28. That components of the framework program be evaluated and implemented in a comprehensive, coordinated, and timely manner with due regard to the multi-objectives, system of accounts, and other criteria defined in the Water Resources Council's Principles and Standards published in the Federal Register, September 10, 1973.

29. That implementation of the framework program be funded at a level commensurate with needs.